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OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania;

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

EDITED
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JANUARY, 1834.

TO THE COMMITTEE ON PUBLICATIONS.

Observations on the Disturbance in the Direction of the Horizontal Needle, during the occurrence of the Aurora of July 10*th*, 1833. *By* A. D. Bache, *Prof. of Nat. Philos. and Chem. in the University of Pennsylvania.*

(WITH A COPPERPLATE.)

Gentlemen,—In the number of this Journal for July last, I gave an account of a disturbance in the direction of the horizontal needle, during the occurrence of the Aurora Borealis, on the 17th of May. On the occasion of the brilliant aurora of the 10th of July, I had a remarkably favourable opportunity of observing a similar disturbance, and as the subject is one which is considered as requiring further observations for its elucidation, I send you an account of those made on the evening referred to.

The needles with which the observations were made, are the same which were referred to in my note of observations made in May. Their places had remained unchanged from that time; the horizontal needle out of doors, under a small wooden enclosure; the horizontal needle within doors on a table placed against a partition wall in my study; the dipping needle out of doors in a small observatory con-

structed entirely of wood, copper, and brass. The needles out of doors have only the local attraction unavoidably incident to a city location, that within doors has, of course, an irregular and more considerable attraction to affect it. The latter needle is exposed to very slight variations of temperature. These particulars are probably sufficient for the present purpose.

I first saw the aurora on the evening of the tenth of July, at three-quarters past nine o'clock; it appeared then as a low nebulous light, resting upon dark clouds, and interspersed by them, but was not sufficiently brilliant to make me entirely certain that it was an aurora: the test afforded by the magnetic needle shows that the phenomena began before this time, and the attention of my observer had been so far drawn towards the sudden diminution of variation at nine o'clock, that an inaccuracy in the observation was suspected, and the needle recurred to, at five minutes past nine, to verify the result before obtained. At ten o'clock, the light in the north was more distinct, extending upwards, nearly 30° from the horizon. At this time I began a systematic set of observations, which were continued until one o'clock on the morning of the 11th. By going a short distance from my dwelling to the east, I have a tolerably good view of the north-eastern portion of the horizon; by going a greater distance to the west, a complete view of the north-western portion, and from the top of my dwelling a tolerable field of view to the north.

At ten minutes past ten the light of the aurora was as brilliant as at the last observation, the brightest portion extending from twenty to thirty degrees east of the north point, and the diffused light extending at least 60° from the north towards the west. The upper limit of the light was a waving line declining rapidly in the eastern portion, and more slowly in the western part. The substratum of black clouds (cumulo stratus) from behind which the aurora appeared to emerge, and which at ten o'clock extended about eight degrees above the horizon, had risen, and a number of small and very black clouds (cumulus) appeared, intercepting portions of the light. At fifty minutes past ten, the waving line, forming the top of the nebulous light, had become more regular, its elevation not being, in any part, more than 12° above the horizon, its extent being about 100°. The floating hill clouds (cumulus) had elongated, diminishing in number, but increasing in size. I supposed the phenomenon to be passing off, when just before twelve o'clock commenced the most brilliant display which I remember to have seen. At twelve, the nebulous light had risen in an irregular line nearly 40° above the horizon; and to the westward of north, apparently emerging from behind the luminous cloud, were diverging beams of light, more brilliant than the body of the aurora, varying constantly in the degree of brightness, and in extent. The appearance at within a few minutes of the time mentioned, I have attempted to represent in the annexed figure, (Fig. 2, Plate I.) When I speak of the beams being diverging, I mean, of course, that they *appeared* to diverge; the point of divergence was below the horizon, but its position I could not, at any time, determine to my satis-

faction. The phenomenon resembled, in form, the beams sometimes seen in the eastern part of the sky when the sun is setting, and which appear to proceed from a point below the eastern horizon, except that these beams were of a beautiful light, apparently streaming from behind a cloud of light. There was at this time no dark cloud visible to the north.

Of the beams which I have endeavoured to describe, those nearest the north faded first, and new ones sprang up further to the west of north, much exceeding in apparent breadth those seen near the north. Small black cumulus and cumulo stratus were scattered through the cloud of light. At eight minutes past twelve, four beams were visible, the broadest being furthest to the west; the last beam died away at twenty-five minutes past twelve, vanishing, after appearing to move westward, about 60° west of north. The general light to the north was still bright, and at half past twelve the most luminous point was about 15° west of north. At one o'clock the aurora had almost ceased, there being still a feeble and diffuse light to the north. A dark cloud (cumulo stratus) occupied a portion of the horizon, having above it two smaller clouds of the same description; in the intervals between these clouds, and to the eastward of the one in the horizon, the feeble light was seen.

In the following table of observations on the magnetic needle, the results which belong to the horizontal needle are referred to the same point, as a zero: to which those in May were referred; this point is not the mean of the days immediately preceding and succeeding the tenth of July, but a reference to it renders the results of the present series immediately comparable with that for May. In the observation of the dipping needle I have been perplexed by a defect of which this is not the place to give an account, but which it is necessary for me to allude to, as explaining why the observations of that needle, made prior to half-past ten P. M., are not given: those which are set down, I have referred to the first observation recorded, as a zero; as differential results, I believe them to be worthy of confidence, though not in the same degree with the corresponding ones for the horizontal needle. The differences marked + correspond to an increase of dip, and those marked — to a decrease. In the column of remarks the different phases of the aurora are briefly referred to.

Time of observation.		Horizontal Needle.				Dipping Needle.		Remarks.
		Changes of variation, needle out of doors.	Attached thermometer.	Changes of variation, needle within doors.	Attached thermometer.	Changes of dip.	Attached thermometer.	
Hrs.	Mins	Mins.	Fah.°	Mins.	Fah.°	Mins.	Fah.°	
July	10							
A.M. 8	30	− 8.0	62					
9	00			− 1.0	74			Wind N.W.
11	00	− 5.0	74	+ 1.0	75			
12	00	0.0	78	+ 2.0	75			
P.M. 1	15	+ 1.5	81	+ 3.0	76			
3	00	+ 4.5	84	+ 4.5	76			
4	00	+ 3.0	83					
5	00	+ 1.5	80	+ 4.5	76			
6	00	+ 3.0	78	+ 6.0	75			
9	00	− 24.5	70	+ 3.0	72			
„	05			− 2.5	72			
10	00	− 27.0	67½	− 9.5	71			Clear.
„	20	− 28.5	67	− 9.5	71	0.0	66.3	Aurora bright.
„	30	− 29.0	67	− 9.5	71 (?)	+ 6.5	66.3	Less bright, extends about 60° around horizon, and is from 12° to 15° in height, at the highest point.
„	40	− 28.5	66¾	− 9.5	71	+ 5.0	66.0	Dark cumulo stratus to N.
„	50	− 24.5	66½	− 8.0	71	+ 2.0	65.5	Aurora decidedly diminished. Wind variable, N.E. to S.E.
11	00	− 18.0	66	− 8.0	71	+ 0.5	65.2	Aurora 5° to 6° high, very bright, — a faint light rises about 15°. Clouds have changed since last observation.
„	10	− 12.5	65½	− 6.0	71	− 2.5	65.0	Brighter than when first seen at 9¾ hours.
„	30	− 9.5	65½	− 4.5	71	+ 0.5	64.8	Aurora faint as at 9¾ h'rs.
12	00	− 25.5	65	− 6.0	70	+ 2.0	64.4	See fig. 2, Plate I.
July	11							
A.M. 12	08	− 21.0	64¾	− 6.0	70	− 5.5	64.2	Beams move to W. of N.
„	20	− 10.0	64½	− 4.5		− 0.5	63.8	
„	30	− 19.5	64¼	− 2.5		+ 2.0	63.8	Last beam dies away at 12h.25mins, 60° W. of N.: the N. still bright: brightest spot 15° W. of N.
1	00	− 4.5	63¾	− 1.5		− 5.5	63.2	Aurora nearly gone: the light still appears to the north where the clouds are drawn up.

In examining the column of this table which contains the observations on the horizontal needle out of doors, there appears a remarkable decline of westerly variation, a movement of the north pole of the needle to the east, at some time between the hours of six and nine, P. M. This variation goes on diminishing until between thirty and forty minutes past ten, after which, with the diminished brilliancy of the aurora, the north pole of the needle begins to move westward. This motion was so regular, and its correspondence with the decrease of the brightness in the northern light so complete, that I supposed the phenomenon about to cease, and left my station on top of the house to examine the record of observations already made. On observing at twelve o'clock, I found to my surprise, that the north pole of the needle had again moved eastward, as shown in the table, and on passing rapidly into the street, the beautiful beams of which I have spoken were seen: this sight I might have missed, having supposed the aurora to be disappearing, but for the warning given by the needle. It is not improbable, from the general course of the phenomenon, as already described, that the beams which I saw first to the west of north, were not the first which had appeared, and that others which preceded them may have been to the east of that point. The variation did not reach as low a point during the brilliant part of the phenomenon as during the former part, the observation at half past ten giving a variation less by 3½ minutes than that for twelve o'clock; it is possible, however, that the second minimum occurred between half past eleven and twelve o'clock. At one o'clock the disturbance of the variation had not ceased, though it had become comparatively trifling, and the northern light had not entirely disappeared. This I have reason to believe was the last part of the phenomenon.

In order to present the results just stated in a form which addresses itself more readily to the eye, I have traced (fig. 1, Plate I,) a broken line, in which the intervals between the vertical lines represent the intervals between the times of observation, and those between the horizontal lines the differences of variation. In other words, the abscissæ of the line correspond to the times of observation, and the ordinates to the amount of variation. From this figure it is at once observable that the westerly variation increased irregularly from 8½, A. M. until 3 P. M., when it attained a maximum; that the decrease from this maximum was also irregular, and very rapid between six and nine, P. M.: this includes a portion of the time of the occurrence of the aurora, and the striking irregularities, which follow, in the broken line, represent, those of the phases of the aurora; the second minimum, at, or before, twelve o'clock, corresponding to the time of the occurrence of the diverging beams.

Recurring to the table, to trace the changes of variation in the needle within doors, we find it after nine, P. M. sluggishly following the changes of the needle out of doors, the north pole moving three minutes of a degree to the westward between six and nine, P. M., while the same pole of the needle without doors moved over 27.5 minutes: suddenly obeying the force which had already moved the

needle without doors, the variation diminishes 5.5′ of a degree in five minutes; between nine and ten, P. M. the diminution amounting to 12.5′, while that of the needle without, was but 2.5′. At this point the needle within is stationary until after a decided impression has been made upon the other needle, of which the variation began again to increase. This increase is observable from forty minutes past ten until half past eleven, between which observation and that at twelve, the variation of the needle within doors has diminished 1.5′, and that without doors 16′. It should be observed that while this needle regained at twelve o'clock the place which it had at half past eleven, the one out of doors passed the corresponding point to the eastward, and was further to the east than at fifty minutes past ten. The correspondence in the motion of the two needles, in any of the intervals between two consecutive observations, though a general one as to direction, is by no means the same in relative amount.

It cannot fail to strike any one who attentively examines the foregoing table, or the line traced to represent the results, that the great *changes* in variation, the motions of the north pole of the needle to the east or to the west, take place rapidly at the beginning of changes in the phenomenon, and that the needle moves but slightly during the continuance of the same class, and degree of brilliancy, of appearances. The beautiful connexion which seems thus to be shadowed out between the effects of electricity in motion, as recently developed by the researches of Faraday, and these observed effects, is too obvious not to strike the mind even of one more intent upon recording facts than of hazarding speculations.

The results of observations upon the dip recorded in the sixth column of the foregoing table, are not altogether regular. Between ten, P. M. of the 10th, and one, A. M., of the 11th, there is a decrease to a minimum, which is sufficiently regular, a subsequent increase followed by a very sudden decrease, and a second increase, which is followed by as sudden a diminution. With such irregularities before one, it would be ill judged to attempt any conclusion from the apparently regular portions of the changes in dip: further observations may throw light upon the causes of the discrepancies, and I have recorded them here, principally with that view. For future observations I hope to have another instrument in which the defects of the present one will be remedied; the results then obtained may give a confidence which I do not now feel in those furnished by the present instrument.

The meteorological changes which took place about the time of the occurrence of this aurora, are worthy of record. On the morning of the 9th of July there was an irregular rain, with the wind at west, terminated by a shower at noon, and succeeded by a clear afternoon, with the wind at west and north-west On the morning of the 10th, the wind was still from north-west, but in the evening had hauled round to the east and south-east.

I subjoin an extract from the meteorological diary kept by James

P. Espy, Esq., which shows a sudden diminution in the amount of vapour in the air, between the 9th. and 10th. of July. The remarks in relation to the winds agree with those already given.

Day of the month.	Temperature at noon.	Dew point.
	Fah.°	Fah.°
6th.	82	53
7th.	—	70
8th.	86	71
9th.	79	65
10th.	78	51
11th.	83	55

"On the 9th the wind was from the N.W., and on the morning of the 10th from the N.N.W., and at noon the upper current from the W. and the lower from the S.E.; on the 11th the upper current was all day from the W., and the lower from the S.S.W."

To return to the observations on the magnetic needle. To determine from them the absolute effect attending the aurora, it would be necessary to make two corrections; the first for the effect of a change of temperature upon the needles, the second for the regular diurnal variation. The first of these is not for any considerable range of temperature amounting, during the few hours between 9, P. M. of the 10th, and 1, A. M. of the 11th, to 6¼° Fah. for the needle out of doors, and to 2° Fah. for the needle within. An idea of the general effect of the diurnal variation, may be formed by the comparisons contained in the annexed table, in which the observations made on the 10th of July, are compared with the mean of those made on the same hours, two days previous, and two days subsequent to the 10th.

Time of observation.	Horizontal Needle out of doors.						Horizontal Needle within doors.						Remarks.
	Mean changes of variation and temperature on 8th, 9th, 11th, and 12th of July.			Changes of variation & temperature on 10th July.		Difference of variation.	Mean changes of variation & temperature on the 8th, 9th, 11th, and 12th of July.			Changes of variation & temperature on 10th of July.			
Hours.	No. of obs'ns.	Min's.	Fah.°	Min's.	Fah.°	Min's.	No. of obs'ns.	Min's.	Fah.°	Min's.	Fah.°	Min's.	
A.M. 8½	4	— 10.0	69	— 8.0	62	+ 2.0							
9¼	3	— 8.0	73				4	— 3.0	77½	— 1.0	74	+ 2.0	
11	2	— 3.0	75	— 5.0	74	— 2.0	2	— 2.5	81½	+ 1.0	75	+ 3.5	
P.M. 1	2	— 1.5	82	+ 1.5	81	+ 3.0	1	+ 2.5	83 ?	+ 3.0	76	+ 0.5	
2	4	+ 3.5	85				4	+ 0.5	83				
3	4	+ 7.0	86½	+ 4.5	84	— 2.4	4	+ 1.5	82½	+ 4.5	76	+ 3.0	
4	3	+ 1.0	85	+ 3.0	83	+ 2.0							
6	2	— 1.5	80	+ 3.0	78	+ 4.5	2	+ 2.0	79	+ 6.0	75	+ 4.0	
7	3	— 1.5	82										
9	2	— 9.5	75½	— 24.5	70	— 15.0	3	+ 0.5	76	+ 3.0	72	+ 2.5	Aurora. (?)
10	4	— 9.5	75	— 27.0	67½	— 17.5	3	+ 1.0	76	— 9.5	71	— 10.5	Aurora.
11	2	— 8.5	74	— 18.0	66	— 9.5	4	+ 1.5	74½	— 8.0	71	— 9.5	Bright.
12	2	— 6.5	71½	— 25.5	65	— 19.0	1	+ 3.5 ?	74	— 6.0	70	— 9.5	Do.

In this table the columns are arranged as in the foregoing one, additional columns being introduced to show the number of observations from which the mean is obtained, and to give the differences between the changes of the 10th and the mean changes. The com-

parison with the variation on the 10th. is assisted in the case of the needle out of doors by the curve of mean variation being traced in a dotted line upon fig. 1, Plate I. In following the curves we see the increase from the morning minimum, at, or before, 8½ A. M., to the day maximum at 3, P. M., and the subsequent descent towards the evening minimum, with an irregularity in the progress of the variation, observable at 7, P. M. on the 10th of July. The lines now cease to have even the most general resemblance. The descent towards an evening minimum at 9, P. M., which appears upon the line of mean variation, concurring with the descent attending the aurora, might be supposed to have produced the suddenness of the effect noted, were it not that a similarly rapid fall occurs between half past eleven and twelve o'clock, contrary to the direction of the line of mean variation. It is possible that the coincidence in the direction given by the diurnal variation with that of the change attending the aurora, between eight and nine, and their opposition between half past eleven and twelve, is the cause of the first minimum being lower than the second, supposing this to have been at 12 o'clock, since the difference between the second minimum and the mean is greater than that between the first and the mean, by four minutes. At 1, A. M. of the 11th, the needle appears to have regained about the mean position, the variation being rather more than the proportional mean for that hour, supposing the increase from twelve to one, to be the same as that from eleven to twelve. Midnight is about the hour of the night minimum, which, however, not unfrequently occurs, after as well as before, that time.

The conclusions deduced from the observations on the needle within doors, coincide, generally, with those obtained from the one without.

Having made material improvements in the needles referred to in this paper, and completed two small observatories in the yard attached to my dwelling, expressly for magnetic observations, I purpose to follow out this subject, and in connexion with it to study the effect of meteorological changes, and, as necessary to the solution of these questions, to preserve an account of the diurnal variation, in such a way that the requisite corrections for the temperature of the needles may be applied. Thus I hope to be able to make a contribution towards determining a question to which the attention of men of science has been particularly called by the recent discussions in the British Association for the Advancement of Science.

Philadelphia, December 24th, 1833.

Notes of an Observer.—Meteorology.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

In the American Journal of Science and Arts for October, 1833, there are two well written articles, by Mr. Redfield, on Meteorology. They contain a most laborious collection of facts, which, if well authenticated, will be of immense importance to meteorological science. Some of them, however, are so anomalous and inconsistant with re-

ceived theories, that I hesitate to put entire confidence in them, and shall continue to doubt until I have the most certain evidence of the facts.

For example: In page 132, he says, "In large portions of the Pacific Ocean, the tides are exempt from the lunar influence. At Tahiti, and the Georgian Group, near the centre of the Pacific Ocean, the tide rises but one or two feet, and it is high water at noon and midnight throughout the year, and this, too, in the very region where the established theory would lead us to expect the lunar tides to be the most regular and powerful." Again, in p. 126, he says, "In Peru, at the height of eighteen thousand feet, the wind has been found to be fresh from the south-west;" meaning, as I understand the whole paragraph, that this is the prevailing direction of the wind at that altitude in that place.

But the chief object which I have in referring to these papers is to correct a very important mistake which will be found at p. 129. The paragraph alluded to is in the following words: "The regular semidiurnal variation of the barometer, in the tropical latitudes, is at its maximum about 10, A. M. and at its minimum about 3, P. M. At New York it is nearly the same; *but at Edinburgh, the effect is reversed, the minimum being at ten and the maximum at three o'clock.* It appears to indicate a system of atmospheric tides resulting from the rotation of the earth, and its connexion with the solar system."

I was startled at this statement, and immediately began to look for authorities to confirm or confute it, when I happened on the following passage in the second report of the British Association for the Advancement of Science, p. 131.

Mr. Forbes there says: "I have investigated with great care during the years of 1827—30, the oscillation in latitude 56°,—the most northerly point in Europe at which any observations of long continuance on this subject have been made. The results have been published at length in the Edinburgh Transactions; and I have also entered into an analysis of all the existing information on the subject. The following are the general results at which I have arrived:—

"1st. That near Edinburgh, in latitude 56°, the mean annual oscillation between 10, A. M. and 4, P. M. is .0106 inch.

"2nd. That the hours of maxima are further from noon in the spring and summer, than in autumn and winter; and that the amount of oscillation of both the diurnal periods diminishes regularly from spring to winter. These conclusions, derived directly from my own observations, I have shown to be the most probable for all parts of the globe, as far as existing observations guide us.

"3d. That the St. Bernard observations, (8000 feet above the level of the sea:) and those of Captain Parry in the arctic regions, both indicate a *true* negative oscillation, though the second result has been overlooked by M. Bouvard."

The cause of these diurnal oscillations of the barometer was explained in the 8th volume of this Journal, p. 389, and it may be here observed, that the theory there given will show why the oscillations at great elevations, such as St. Bernard, should be negative; at least why the barometer should stand higher at three o'clock than at ten.

If we suppose the air below the level of St. Bernard to be ten degrees warmer at three than at ten in the morning, its expansion will be a little less than $10 \times \frac{1}{480}$ of the whole: because its mean temperature is above 32° Fah. Let us call it $10 \times \frac{1}{500}$ of 8000 feet, and it will appear that 160 feet of air is thrust upwards by expansion from heat, between the hours of ten in the morning, and three in the afternoon, above the level of St. Bernard, which will cause an elevation in the barometer of .016 of an inch. This will be quite sufficient to cause a negative oscillation of the barometer, if these two hours only were considered, ten in the morning, and three in the afternoon. But it must be acknowledged that it leads to the conclusion that at these great altitudes there should be found only two diurnal oscillations, of which the maximum would be about three o'clock, and the minimum just before sunrise. If I had the St. Bernard observations I would examine them to see whether the facts would justify the theory. If it should be found that there are four diurnal fluctuations at St. Bernard, all negative, it will refute the theory here given; for, according to it, the barometer ought to rise more rapidly from sunrise till ten o'clock, than in the plane below, from the combined influence of the increasing *elasticity* of the air, and the increasing *weight* of air above the level of the plane of observation. And it was shown, in the essay mentioned above, that the former of these alone is the cause of the rise in the plane. Perhaps some gentleman who has access to the St. Bernard observations, may be satisfied of the plausibility of these remarks, and be induced to take the trouble to make the investigation.

As to the oscillations in the arctic regions, whether they are positive or negative, they will not invalidate the theory given above. For the causes assigned do certainly exist, and certainly produce, in whole or in part, the very phenomena observed. I may not have assigned the exact difference of temperature of the air below St. Bernard at 10, A. M. and 3, P. M., but that there is some difference no one can doubt.

I do not know that any observations have been made to ascertain how much the air is heated diurnally at great heights by the rays of the sun; and I would propose these very oscillations of the barometer at St. Bernard as a means of ascertaining that fact; for it is plain that the more it is heated, the greater will the rise of the barometer be at the warmest part of the day, as the quantity of air raised above St. Bernard by expansion, will be in exact proportion to the rise in temperature of the whole mass of air below the place of observation.

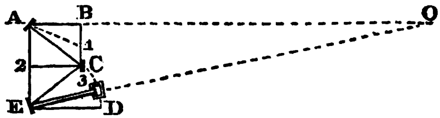
Remarks on instruments for Measuring Distances at a single observation.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

In the Journal for March, 1833, there is a notice of a reflecting instrument for measuring distances at a single observation, invented by Nathan Scholfield, of Montville, Connecticut. In this instrument two mirrors are arranged in the same line from the eye, one of which

is movable on an axis. The distance of these mirrors is the known base of a right angled triangle.

Since reading this notice, I have ascertained, that the project of measuring distances by a single observation is not new, although probably the instrument of Mr. Scholfield will be found more simple and useful, than any previously invented. The following instrument was described by Wm. Pitt, of Pendeferd, England, in 1795.



ABCDE, the instrument *in plano;* O, the object, whose distance is required; at A, at C, at E, and at 3, are to be fixed speculums, properly framed and fitted, that at 3 having only its lower part quicksilvered, the upper part being left transparent to view the object; the speculum at A being fixed obliquely, so that a line A 1, drawn perpendicular to its surface, may bisect the angle B A C; that at C being perpendicular to the line C 2; those at E and 3 being perpendicular to the index E 3, and that at E being furnished wth a sight; the arch D C to be divided from D in the manner of Hadley's quadrant; the movement of the index to be measured by a micrometer. The object being received on the speculum A, is reflected into that at C, and again into that at E, and that at 3 on the index; the index being then moved till the reflected object in the speculum at 3 exactly coincides with the real object in the transparent part of the glass, the divisions on the arch D 3, subdivided by the micrometer, will determine the angle D E 3 = the angle A O E; from which the distance O may be determined. The instrument may be adjusted by holding up a staff at a distance whose length is exactly equal to A E."

It is to be hoped that Mr. Scholfield will perfect his instrument, which may be very useful at sea in ascertaining at once the distance of ships, rocks, and capes. The accounts of foreign inventions inserted in the Journal of the Franklin Institute, are very important, both as sometimes furnishing hints to American genius, and as preventing the needless toil of genius to discover what is already known. The waste of money, also, in obtaining invalid patents for things already published, is to be taken into consideration. If the Journal of the Franklin Institute were more generally read by American inventors, it would save much waste of money and of genius.

Brunswick, Maine, Nov. 29th, 1833. A.

Remarks on the Culture of Seeds for, and the Manufacture of Vegetable Oils. By Charles V. Hagner, *Manayunk, Philadelphia county.*

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

I was much pleased to find in the Journal of the Franklin Institute for November, an essay containing some useful hints on the subject of the manufacture of vegetable oils. I have long been asto-

nished that a subject of so much importance to the agricultural, manufacturing, and commercial interests of our country, should be so long neglected, and that more attention has not been paid to it. I am perfectly convinced that there are many seeds from which oil for various purposes could be produced, and which could be grown with great advantage to the agriculturist. All that is necessary, is to draw his attention to the subject, and induce him to make the experiment. It is but a few years since the Palma Christi, (Castor Bean,) was first grown in quantities in this country, yet the introduction of it here has had the effect, as almost every one knows, of improving infinitely the quality of the oil, and of supplying the market at from two to three hundred per cent. cheaper than was paid for the nauseous and miserable stuff, formerly received from the West Indies and elsewhere.

One of the seeds mentioned by your correspondent, colchicum or rape seed, is of the greatest importance, and produces an oil which is, and has long been, much wanted for manufacturing purposes. This seed is grown abundantly in all parts of Europe, and the oil made from it is extensivley used in the process of manufacturing cloth; it is, I believe, the cheapest oil they have, and takes the place of the common kinds of olive oil, which the manufacturers of this country are obliged to use at a great cost: this is a matter of considerable importance, when it is known that to every 100 pounds of wool carded, there is consumed from two to three gallons of oil. The rape seed oil is so cheap and abundant in Germany that it is much used in adulterating linseed oil; hence the bad quality of some of the German paint oils, as the rape seed oil does not possess the drying qualities of that from flax seed, and is therefore unfit for the purposes of painting, &c.

Having been for a long time engaged in the manufacture of flaxseed oil, and having made various experiments on other seeds, I have, of course, had some experience on the subject. In relation to rape seed I had an excellent opportunity of making full and satisfactory experiments. In the year 1822 or 1823, an English gentleman who was familiar with the culture of rape seed, and who had a farm somewhere in the neighbourhood of Salem, N. J., brought to my establishment about forty bushels of rape seed, which he had produced upon his farm. The account he gave me of its culture was this. Two acres were sown with this seed, (broad cast) in the month of August; it sprouted, and was growing very handsomely, but late in the fall the cattle broke into it, and as he thought completely destroyed it; he abandoned the experiment, and suffered his cattle to roam in it all winter; but in the spring, observing it sprouting again, he put up the fence, and as he expressed himself, "let it take its chance." The two acres with this, as he considered it, unfair experiment, produced him about forty-four bushels of seed, for which I offered him four dollars per bushel, which he refused to take. I expressed it for him, and although my apparatus was not by any means perfectly adapted to the purpose, the manufacture differing in some respects not necessary to state, from that of flax seed oil, I produced three and a half gallons per bushel. The cake, that is, the pulp after the oil is ex-

pressed from it, he valued highly for fattening cattle, and refused to take seventy-five cents per bushel for it; the oil he sold to a woollen manufacturer for one dollar and thirty cents per gallon; thus, including the cake, realizing five dollars and thirty cents per bushel, out of which was paid the expense of manufacturing. It is, I am told, considered in England a profitable crop, although the price is not much, if at all, above two dollars per bushel. The gentleman was in high spirits as to the result, and told me he intended to go into the culture of it more extensively, but from what cause I do not know, I have never seen him or heard from him since—whether he failed in his after experiments, died, or returned to England, I do not know; I have not, however, the least doubt that our soil and climate are well adapted to the culture of this seed; it is of the same family with the cabbage, which every one knows grows luxuriantly here. We have, besides, such a variety of soils and climates in our country, that if it will not succeed in one district it certainly will in some other.

Another seed valuable for oil is the sun flower: I have never tried this, but am told it produces a very excellent salad oil; I have no doubt the culture of it, properly managed, would be both useful and profitable.

The bene seed cultivated in the southern states, produces a valuable oil, and yields more than any seed I know of; it is said that one hundred pounds of seed produces ninety pounds of oil. I never tried the experiment fairly, but have no doubt as to the fact; some years since I expressed a barrel of the seed, but do not now remember the quantity produced; it was, however, such as to astonish me. The seed was eight years old, and had become in a manner rotten and rancid, the oil of course was not fit for the table, but it was, nevertheless, beautifully transparent and fluid, more so than any I had ever seen. It struck me that it might perhaps be valuable for watch makers. I believe I have a small quantity of it left, and should like some one who knows more of that matter than I do, to try it.

The common thin-shelled pig nut of our country, is said to make an excellent salad oil; the manufacture of it is easy; the shell is so thin as to interfere but little in the process; the nut is put into the mill, and ground up without removing the shell.

The cotton seed, if hulled, will yield a large quantity of oil, and I am glad to learn that attention is being paid to it. I once manufactured a small quantity, grinding the hull and cotton fibre with it; the quantity of oil produced in this way will not of course pay the expense of manufacturing it, so much of the oil being absorbed by the hull and cotton. Your correspondent does not appear to be practically acquainted with the plan of taking off the hull which he suggests, by means of a barley hulling machine. It is totally impracticable, for the following among other reasons: first, if the result could be accomplished in that way, the expense of power, labour, &c. in so doing, would be such as to leave little or no profit; it would, in fact, be much more trouble and expense than all the rest of the process of making the oil: second, the seed cannot be hulled in that way; I speak from experience, being practically familiar with the process of

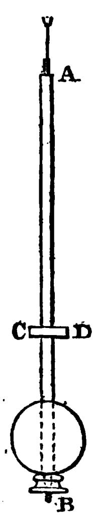
hulling barley; the reason is, that when the grist is put into the machine, and the stone had penetrated through the hull, and come in contact with the soft and greasy parts of the seed, it would become so greased, or to speak technically, glazed, as to render it perfectly incapable of doing any more work; the seed would then come out in pretty much the same condition that it went in. I rather think that a method similar to that which is used in chocolate mills for separating the hull from the cocoa, would be more feasible. The nuts are broken up by being passed through rollers of a peculiar construction, and the shell is afterwards blown out by a common fan. The objections to this plan are, the difficulty of breaking up the cotton seed, on account of its toughness; the further difficulty, from its adhesiveness, of separating the hull from the kernel of the seed. I have been told that some person at the south has succeeded in making a machine for hulling cotton seed, and I perceive among the list of patents in the Journal for November, one for a machine for that purpose; the description of it, however, is so imperfect that I cannot exactly understand the nature of it. If, as is said, it does hull one hundred and fifty bushels per day, it is an important matter, and the object is attained.

The above remarks have been hastily thrown together, after reading the essay above alluded to; they come from one who is in a measure practically acquainted with the subject, and may perhaps answer some useful purpose.

Manayunk, December 16*th*, 1833.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Description of a Wooden Pendulum Rod, secured from the action of moisture. By Wm. Howard, *U. S. Civil Engineer.*



This pendulum is similar to that contrived by Captain Kater, and described by him in Nicholson's Journal, for July, 1808, and in Lardner's and Kater's Treatise on Mechanics. The only difference consists in the method of securing the wood from the influence of the hygrometric state of the atmosphere. This is done by taking advantage of the property of thin metal plates, of *buckling*, as the workmen term it. The annexed figure represents the manner in which this is contrived. A rod of prepared wood of convenient size, is hermetically enclosed in a box of thin tin, or brass, made to fit on it loosely. The supports, for the spring above at A, and for the nut beneath at B, project through the ends of the box, the openings being made air-tight by solder, and are fastened to the wooden rod in the ordinary way. The box does not continue of the same size, throughout its whole length, but is enlarged at C D, to form a flat case, projecting about half an inch from the rod every way. The springing, or buckling, of the top and bottom of this case, is intended to allow the metal to expand and contract freely, without

affecting the wooden rod; which is at the same time, entirely secured from the exterior air.

The small quantity of motion required for this purpose, will not render it necessary, in all probability, to enlarge the case C D beyond the size we have here assigned to it. If we take the expansion of rod iron as given by Mr. Hassler, we shall find, that, for a difference of temperature of 100° Fahr., and a length of rod of forty-three inches, the quantity of motion to be provided for, will be only $\frac{3}{100}$ths of an inch, even supposing the wood to be unalterable in its length.

The proper place for this case I have deemed to be two-thirds of the length of the rod, or as near as may be to its own centre of oscillation.

Should it be desired to compensate the small expansion and contraction, by temperature, of the wood thus protected, this could be easily effected by using either zinc or lead, according to the plan either of Capt. Kater, or of Mr. Bailey, described in the Treatise on Mechanics, above referred to.

I propose, as soon as I can procure a pyrometer of sufficient delicacy and exactness, to examine the expansibility, by heat, of the different kinds of wood, taken in various directions to the fibre, and secured in metal boxes in the manner above described.

On the Causes of Spontaneous Combustion.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—I wish, through the medium of your Journal, to solicit the attention of some of your scientific readers to the causes of spontaneous combustion, generally; and with a view particularly to the investigation of those causes that are liable to produce it in cotton, woollen, and paper factories, from the stock, or waste, being accidentally impregnated with oils, or other substances.

As very few manufacturers are sufficiently acquainted with chemistry to determine accurately the causes of the effects which they may observe, it is therefore desirable that men of science, who have leisure, inclination, and information,* adequate to the task, should undertake, and perform, a series of experiments on the intermixture, or chemical combination, of different materials, together with the proportions, situations, degrees of heat, &c. requisite, in each case, to produce spontaneous combustion, and that publicity should be given to the same through the pages of this Journal.

The vast amount of capital invested in various kinds of manufactures, and the large number of mechanics and workmen of every grade and description, who are interested, either directly or indirectly, in the safety and prosperity of our factories, whose daily support and almost sole means of accumulating property, are derived from their employment therein, all unite in the requisition.

It is confidently believed that many buildings have been destroyed

* Our correspondent has forgotten an important item, viz. *means.*—Com. Pub.

by fire, originating in spontaneous combustion, and that there is frequently great danger, where it is least suspected.

To aid in the inquiry, agents and superintendents, as well as the observers in the several departments of factories, should unite in communicating such cases as may have come within their notice, together with such facts and circumstances as attended them.

To contribute my mite, I will give an account of the few instances that are within my knowledge, although my statements cannot be as detailed as I could wish, from my not having paid much attention to the subject at the time the observations were made.

The first instance of spontaneous combustion, or that which was apparently so, and was not otherwise accounted for, was in a quantity of wood ashes.

The ashes were in the body of an old wagon, with boards above, at the sides and ends, and had been accumulating for more that two years, to the amount of fifty bushels, or more. The ashes belonged to a very careful man, if the epithet is not altogether inapplicable to a person who would deposit ashes in a wooden vessel, whose constant custom was to have his ashes taken up from the hearth in a metallic vessel, and stand therein until entirely cold, before they were put into the usual place of deposit, and no danger was apprehended from this practice.

One evening about sunset, smoke was perceived to issue from the body of ashes, and it was at first supposed that one of the domestics had, contrary to strict orders, put in some hot embers; but on inquiry it did not appear that any ashes had been added for three days, and this appeared the more probable, as several vessels were then found standing full of ashes which had been taken up.

When the fire was discovered, it was expected that it was confined to a small spot only, and that a small quantity of water would be sufficient to extinguish it, but on pouring water upon the mass, the ashes were scattered very extensively, and on further examination, it was found that the boards in several places were burnt almost through, and that the whole quantity of ashes was in a state of ignition like embers immediately from the fire. Nothing but a timely discovery prevented the destruction of a large portion of a village, for the buildings were all of wood, and so situated that the chance of saving one out of twenty would have been but very small.

I should be glad to throw some further light on this subject, but every thing else in relation to it was mere conjecture, and whether some oily substance was accidentally intermixed with the ashes, or was introduced by carelessness, or otherwise, or from what cause the combustion was produced, remains entirely unknown.

Instances have been known in which cotton has taken fire by wiping up with it oil that had been spilled, both linseed and sperm oil.

Weaver's harnesses in factories are varnished with a varnish made of the following materials, the same, in greater or less proportions, being used by different manufacturers: the usual ingredients are, linseed oil, spirits of turpentine, litharge, red lead, shel lac, umber and India rubber. The composition is boiled down to a thick varnish, and

laid on to the harness with a brush. The harness is usually made of cotton twine.

I once knew an instance in which a hank of twine, which was varnished for mending harness, took fire, spontaneously, while hanging to dry.

I mention this circumstance, because in many factories it is customary to varnish and hang the new harness to dry in the garret, or some other spare room of the mill; and likewise to lay away the old worn out harness in the same place, and with very little caution as to the quantity that comes in contact: a practice that may lead to dangerous and destructive consequences.

I hope my remarks will not be deemed irrelevant. It will be readily perceived that my object is, at this time, more to obtain than to communicate useful information.

Very respectfully, yours,

J. A. B.

Pittsfield, N. H., December 2nd, 1833.

FRANKLIN INSTITUTE.

Monthly Meeting for Conversation on Mechanical Subjects.

A machine patented by James Secors, of Bristol, Pennsylvania, for cutting straw, was exhibited. The straw is cut by an oblique cutter, set in motion by a winch, a fly wheel serving to regulate the movement. This machine will be described in the Journal of the Institute.

Mr. Joseph L. Dutton explained by reference to a model, the method of constructing the cloistered arch proposed by him for covering the rooms in the Girard College. This plan of arching has been submitted to the Committee on Inventions, from whom a report may be expected.

Prof. A. D. Bache brought forward the Kaleidorama, a philosophical toy, lately introduced, for illustrating the "memory of the eye." The combinations of motion produced by it, render the exhibitions amusing as well as instructive.

EIGHTH EXHIBITION OF DOMESTIC MANUFACTURES.

Reports of the Judges of the articles exhibited at the Eighth Exhibition of Domestic Manufactures; held by the Franklin Institute in October, 1833.

[Made to the Committee on Premiums and Exhibitions.]

REPORT OF THE COMMITTEE OF JUDGES ON COTTON GOODS.

The committee on cotton goods report that they have carefully examined the numerous specimens submitted to their inspection. It was with great pleasure that they beheld so large a collection of manufactures of native production, evincing the ingenuity, skill, and industry, of the country. The specimens of novelties in the depart-

ment of cotton manufactures, were not numerous, but the general appearance and make of the various fabrics indicated such improvement, as, in the opinion of your committee, will insure a steady and certain advancement towards still greater perfection.

The committee recommend that premium No. 58, be awarded to the manufacturer of No. 384, deposited by Messrs. Haven & Neide, for four pieces of beaverteens of a good and substantial quality, much superior to most of the imported article. No. 384 was the only specimen exhibited.

That premium No. 61 be awarded to William Almond, the manufacturer of No. 12, a specimen of power loom woven Marseilles, which is considered as a very fair effort: there is, however, great room for improvement in the article. No. 286, manufactured by the Hamilton Manufacturing Company, consisted of six dozen of cotton towelling, of a good quality, and well made.

That premium No. 64 be awarded to the Merrimack Manufacturing Company, for Nos. 263 and 264, rich chintz prints, being of superior excellence in style, and displaying colours of great brilliancy; other specimens from the same factory deserve much praise, for general style and execution. The prints from the Phœnix Works were of a highly improved character, of superior cloths, and at least equal in style to any exhibited, and would have commanded the premium, had the colours been more clear and decided. The prints from the Eagle Works and Cochico Manufacturing Company, were also highly meritorious, and together with those already mentioned, afford ample proof of astonishing advancement in this branch of manufactures.

The committee further recommend that premium No. 63 be awarded to the Bristol Print Works, for No. 55, the only sample of furniture chintz exhibited; the colours in these goods are vivid, and the patterns showy: in this article there has been great improvement, which may be carried still further.

That premium No. 72 be awarded to Joseph Ripka, for Nos. 24 and 25, cantoon cords and crape; they are exceedingly good imitations of the foreign article, very durable and desirable goods. The pantaloon stuffs manufactured by the Hamilton Manufacturing Company, are very creditable specimens of the kind. This description of goods is considered as calling for encouragement.

That premium No. 94 be awarded to the York Manufacturing Company, for Nos. 53 and 54, canton flannels; a superior fabric of uncommon regularity of nap, and presenting a beautifully smooth surface. To Mr. William Almond much credit is also due for his specimen of Canton flannels, a substantial article, well calculated for general use. The consumption of this article is very extensive.

For premiums Nos. 57, 60, 67, 70, 71, 73, and 94, no candidates appeared, although it is well known that many of the articles for which these premiums were proposed, are produced by our manufacturers. Perhaps by continuing to offer these premiums competition may be elicited.

For premium No. 59 no samples properly called cambrics, were exhibited, but No. 91, checked cambrics manufactured by Joseph

Bancroft, approaches very near the article sought; it is a very fair specimen of the kind, and entitles the manufacturer to great praise. The demand for this description of goods has been considerable.

For premium No. 65, but one sample was exhibited, No. 205, plate prints, price ten cents, manufactured by W. Wister; these goods are substantial and serviceable. The premium being for the best prints not exceeding 11½ cents per yard, and there having been no competition, your committee decline recommending the award in this case.

For premium No. 68 were exhibited very beautiful specimens of gingham check, Nos. 88 and 89, manufactured at the invaluable institution for the deaf and dumb. It is believed that the number of the yarn is below 45, which will preclude these samples from the premium, but your committee feel great pleasure in witnessing so perfect specimens of workmanship coming from so interesting a source; they cannot refrain from recommending that encouragement be afforded to the maker of these goods, with the view that he and others in the same institution may be stimulated to further exertion.

For premium No. 69, a very handsome sample of linen diapers, No. 99, from the Shakers, was exhibited, but it is believed not in sufficient quantity to entitle them to the premium. The specimen is of a superior make, and shows ability to produce an abundance of an article much used.

The following articles were exhibited for which no premiums were offered:—

Numerous samples of bleached cotton shirtings and sheetings, from various manufactories, possessing all the necessary qualifications which are sought for in this description of manufactures. There is a manifest general improvement in this branch of manufactures.

Very superior and well made cotton canvass, from the manufactory at Paterson, N. J., much used by our shipping.

Coloured cambrics of various qualities and shades, and excellent finish, from the Cochico Manufacturing Company, and Great Falls Company, and others, deposited by Henry Farnum & Co. The home productions of this article have nearly excluded importations.

Sewing and knitting cotton cords, from the factory of Philip Garrett; cotton cords from Enoch Roberts; spool cotton from Joseph Bancroft, are fair specimens, and creditable to the makers; cotton suspenders from Wm. Poole, are of a superior character; checks from Alexander Struthers, are of a very substantial quality.

Britannia handkerchiefs, from James F. Simmons, are pretty specimens of that style of work; of this kind of goods there is great consumption.

Printed cotton vestings, from the Hamilton Manufacturing Company, is a fair low priced article, for the increased manufacture of which there is great room, as the demand is very extensive. An improvement in this article is deemed desirable.

Knotted counterpanes, deposited by Messrs. Haven & Neide, are of a superior quality, and entitled to particular commendation. Your

committee consider this as an article for which a premium might be offered, if produced in sufficient quantity, and at a reasonable price.

Quilts and bed spreads, of great variety and good fashion, all claiming admiration for their fair makers; some of exceeding beauty and neatness, affording ample testimony to the ingenuity, taste, and industry employed in their construction.

With two trifling exceptions the committee believe they have noticed all the articles which are mentioned in the schedule placed in their hands, and it will afford them pleasure if they have been so fortunate as to have performed their duty to the satisfaction of the Institute, and of the several depositors.

GEORGE L. OLIVER,
JOHN COOPER,
AARON KILLIE,
BENJ. W. TINGLEY,

Philadelphia, October, 1833.

Report of the Committee of Judges on Woollen Goods.

The committee of Judges on woollen goods respectfully report:—That in their examinations attention has been directed as much as practicable, rather to the process of manufacturing, than to the material out of which the goods are made, believing that the manufacturer who produced the best article from the same stock, or as good an article from an inferior stock, was best entitled to the commendation and to the premiums awarded by the Institution. The great variety of goods submitted to their examination, has precluded the possibility of a report so detailed as to embrace every article, and they doubt not but much that deserves particular notice and commendation has escaped their observation. They feel themselves, however, fully warranted, and indeed constrained, to bear testimony to the general excellence of the goods brought under their inspection.

The following details will embrace the various descriptions of goods examined by the committee:—

Blankets,—The specimen of woollen and cotton blankets deserves unqualified commendation. The article appears to combine warmth and lightness; and the union of the two materials for that purpose accomplishes a desirable object. The Wilton super blankets are not surpassed by any article in blanketing that has ever been seen by the committee. The whiteness, and the fleecy character of the fabric, deserve special notice.

Flannels.—In this article perhaps much improvement is not to be expected, the specimens exhibited, in the opinion of the committee, sustain the character of the domestic flannel, both for fabric and colour.

Cassimeres.—No. 235, 2 pieces, No. 236, 2 pieces, and No. 237, 2 pieces. The only lot of five pieces submitted to the committee, They appear to be good in the colours, and well made goods; but No,

565, a piece of black, and No. 2121 of lot 238, a piece of striped cassimere, both for closeness of texture and beauty of finish, exceed, in the opinion of the committee, any other cassimere in the exhibition. No. 222, a piece of double milled drab cassimere, is also a well manufactured article. All the specimens are creditable to the manufacturers.

Sattinetts.—No. 229, eight pieces of Oxford mixed, are excellent goods, deserving high commendation, combining width, strength, and beauty in an unusual degree.

No. 45, three pieces of printed sattinetts, also have claimed the attention of the committee. The goods, though light in the fabric, are well made, and the printing is executed in a masterly manner.

No. 272, twilled felting, for paper makers, is a well made article, and appears to be adapted to the purpose for which it is designed.

Cloths.—Nos. 239, 240, 242; fancy colours. These goods appear to the committee the best of the fancy colours; the dye is good, the texture firm, and the finish free from objection.

No. 387, four pieces, No. 388, three pieces; fancy colours. These goods, for lustre and richness of finish, perhaps surpass any other lot in the exhibition. They have also much brilliancy of colour, and the material is worked up to great advantage. The committee have examined them with satisfaction, and commend them with great confidence.

No. 245, three pieces of wool dyed blue, at three dollars per yard; this is the only lot in the exhibition at that price; the goods are well made and well finished.

No. 244. These cloths the committee believe to be the best in the exhibition, and they assign some superiority to that with the private number, 29848, over the other two. The excellence of the wool; the texture of the cloth; and the close and neat finish, all combine to recommend these goods. But faithfulness requires that we should state that in these cloths, the listing, or at least portions of it, is sewed on. This practice, too common in American cloths, is reprehensible in all cases, but more to be censured in fine goods, we venture to hope it will soon be abandoned; for besides the loss which the appearance of the cloth sustains from being deprived of the embellishment of a rich listing, the absence of a list united with the cloth in weaving, creates distrust in relation both to strength and colour.

No. 457. An excellent piece of cloth, but little inferior to the goods just mentioned; well made, and free from the objection in relation to the listing, which the committee have censured with perhaps too much severity.

No. 231, two pieces of drab cloth, entitled to great commendation for colour, texture, and finish.

No. 232, two pieces of steel mixed cloths; in these goods the colours are well mingled, and the goods excellent.

In giving this brief detail, the committee are aware that they only very faintly convey the impression that has been made on their minds by the examination they have been requested to make; and in closing this report, they beg leave to express their high gratification at the evidence furnished by this exhibition of the excellence of American fa-

brics, and to express the hope that the enterprise and skill which have brought them, in their infancy, so near to the excellence of the best specimens of European productions, will not be relaxed until they attain perfect equality with them.

William Worrell,
James Boggs,
Charles S. Wurts.

Philadelphia, October 5th, 1833.

Report of the Committee of Judges appointed to examine Carpets and Carpeting.

The committee of Judges respectfully Report:

That, on a careful inspection, they were gratified to perceive that the articles now presented in this branch of our home manufactures, will bear an advantageous comparison with those of the previous exhibition.

In the Ingrain and Brussels carpeting, although an improvement in the fabric is not very observable, it is strikingly apparent in the colours and shading. This remark is particularly applicable to the three pieces of superfine ingrain No. 29, from the Lowell Carpet Manufactory, and to the four pieces of Brussels, No. 31, from the manufactory of Mr. John Humphreys, of New York. These goods are of excellent quality and style, and satisfactory assurances have been received that they are exclusively of American workmanship, throughout all the processes, from the raw material to the finished product of the loom; also that the materials are all American, except as regards the ingrain from Lowell, the wool in which is understood to have been imported. The committee consider these specimens, Nos. 29 and 31, entitled to premiums.

The five pieces of Brussels carpeting, Nos. 79, 249, and 250, from the manufactory of Mr. Isaac Macauley, at Bush Hill, near Philadelphia, fully sustain the high character heretofore accorded to similar articles from that establishment. The worsted, however, in the present specimens, although scoured and dyed by Mr. Macauley, was spun in Europe. But for this circumstance the committee might have hesitated in awarding the palm to Mr. Humphreys.

The only piece of Venitian carpeting exhibited, viz. No. 489, manufactured by Mr. John M'Fee, of Philadelphia, is an excellent article, both as to quality and colours; but its appearance is somewhat injured by the numerous small fibres of the filling which protrude above the surface of the worsted.

In the several kinds of hearth rugs, much improvement is manifest, and though all the specimens are very creditable to the makers, the committee are constrained to refer particularly to the two tufted rugs (sent after the specified hour,) from the manufactory of Mr. Isaac Macauley, as being far superior to the others, and equal to any of foreign manufacture.

The ten pieces of oil cloth, No. 505, made by Mr. Geo. Uhler, and

the four pieces, No. 318, made by Mr. Isaac Macauley, both of Philadelphia, are considered very superior to the imported article; and the committee would also recommend, as entitled to honourable notice, the four pieces of floor oil cloth, No. 429, made by Messrs. Wiley & Cooper of Brooklyn, L. I.; which, while equal in quality to any now or heretofore exhibited, are superior in style, and have a closer resemblance to Brussels carpeting.

All which is respectfully submitted.

L. Mifflin,
David Lapsley, jr. } *Committee.*
Wm. Christie,

Report of the Committee of Judges on Straw Bonnets.

The committee of judges appointed to examine the manufactures of straw goods, Report:

That they have given due attention to the articles exhibited. They regret that the name of the manufacturer of the straw in the bonnets No. 375, has not been made known. We recommend the three bonnets to the attention of the Institute, as being very superior in quality, and made with great neatness.

The Leghorn plat bonnet, No. 491, with the piece of braid No. 492, of the same quality with the bonnet, does credit to the manufacturers; much taste has been displayed in the making up of this bonnet.

They understand that the bonnet No. 441, by the children of the Deaf and Dumb Asylum, has been manufactured from the raw material, and by them made in its beautiful form; if such be the case, we would call your attention to this specimen; we trust the makers will meet with encouragement.

The two bonnets, No. 116, from the Shakers' establishment, are of excellent material, and demand our praise.

Geo. W. M'Clelland,
Wm. E. Whelan,
P. Penn Gaskill.

Philadelphia, October 5th, 1833.

Report of the Committee of Judges of Iron and Steel Articles.

The committee report that they have had under examination, blistered steel made by James Rowland, which upon trial, was found to be decidedly inferior to good English blistered steel, and also to specimens exhibited by the same maker on former occasions.

Iron from Lancaster county, deposited by James Rowland, of good quality, and handsomely hammered.

Rolled iron, from the Cumberland Works, Tennessee; a good arti-

cle, and one which will fully compare with the English chain cable iron, both for strength and ductility.

JOHN AGNEW,
RUFUS TYLER,

Report of the Committee of Judges of Musical Instruments.

The committee beg leave to present the following Report:

There were but three instruments (piano fortes) coming under the specification for the medal offered by the Institute, viz.—

A square piano forte, No. 529, Thomas Loud, maker.

Do. Do. No. 204, Nunns, Clarke & Co., makers.

An upright piano forte, No. 530, Loud & Brothers, makers.

All three being made of wood "*the growth of the United States.*" Giving their preference in the first place to square pianos, in general, the choice was confined to the first two named; and, after a minute examination, they agreed, that the one made by Mr. Thomas Loud, was the better instrument of the two. It is, however, due to Messrs. Nunns, Clarke & Co., to state, that the points of difference between their instrument, and that of Mr. Loud, were so trifling that they found great difficulty in coming to a decision.

They further beg leave to state, that the best piano forte presented at the exhibition, without reference to exterior, was No. 528, a square piano forte, manufactured by Mr. E. N. Scherr, but they would also observe, that the treble part of this instrument was three stringed, which gave it an advantage that, perhaps, it would not otherwise have possessed over No. 193, a mahogany square piano forte, made by Messrs. Nunns, Clarke & Co.; this last named, being itself much superior to their first mentioned one of American wood. The committee cannot pass over two upright piano fortes of great merit, one made by B. & W. Nunns, No. 568, which they consider one of the best of the kind for its sweetness and purity of tone, that has ever come under their notice; the other, No. 530, above mentioned, made by Loud & Brothers, for its good tone, and truly tasteful and splendid exterior, the case being made entirely of American bird's eye maple.

A square piano, No. 194, made by A. Babcock, of rose wood, for good tone and handsome exterior, and another, No. 282, made by C. F. L. Albrecht, met the favourable notice of the committee.

They also thought worthy of notice, a piano made by Mr. C. Meyer, with a shifting movement, by which the keys can be raised a semitone; this, although not a new invention, may have merit from the manner in which it is applied. An iron framed square piano was also remarked as having good qualities.

For the sake of preserving in musical instruments, piano fortes especially, a simplicity of exterior which the committee deem essential to beauty, they take the liberty of observing, that there were *some* instruments at the exhibition, whose bad taste and extravagant style

of decoration, produced in their minds only a feeling of regret that so much excellent matter was wasted!

In concluding their report, the committee beg leave to suggest to the committee on premiums and exhibitions, that in their future offers of premiums for piano fortes, they should expressly state the class or kind of instrument, the number of strings, whether a grand, or square, or upright piano; the want of such a distinction renders the duties of this committee extremely difficult, as it is scarcely possible to institute a just comparison between instruments of different grades.

All which is respectfully submitted.

WILLIAM NORRIS,
J. C. B. STANDBRIDGE,
BENJ. CROSS,
W. H. W. DARLEY,
HENRY J. BOLLER.

October 7th, 1833.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN JULY, 1833.

With Remarks and Exemplifications, by the Editor.

1. For *Discoveries in Natural Philosophy, reduced to practice,* made by Horatio Gates Spafford, late of Lansingburg, Renselaer county, New York, deceased. Granted in pursuance of a special act of Congress, passed July 3, 1832. Issued to his relict and administratrix, July 5.

(Some remarks on this patent will appear in the next number.)

2, For an improvement in the *Truss for Varicocele;* Amos Hull, city of New York, July 5.

The patentee, after describing the nature of varicocele, and the precautions necessary in the application of a truss to that disease, insists very particularly on the importance of giving to the pad of the truss that particular degree of inclination which may be most suitable to the state and feelings of the patient. The method recommended for effecting this, is to be used in connexion with the truss patented by Dr. Hull several years since, and reissued under an amended specification, August 17th, 1831. The contrivance which is the subject of the present patent, consists of a circular button turning upon a pivot, and varying in thickness by a regular ascent; its flat sides being inclined to each other. The edge of this wedge-formed button, lies under that through which the spring passes, in the former truss; by turning it round it cants the pad, in any degree which may be required. The same kind of fixtures may, it is said, be applied to other species of hernia, when a similar variation in the pad is desired. This appears to be a simple, and sufficiently good method of canting the pad. Various other modes have been devised for producing the

same effect, and we are not aware that the one here proposed possesses any special advantages.

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3. For a *method of impeding Carriages when descending hills;* Gorham Bunker, Truxton, Courtland county, New York, July 5.

This is a trifling contrivance, very inferior to several brakes which are in use, and which can be made to operate with a graduated force. A lever is placed on the frame of the carriage over the fore axle, which when drawn forward by the driver, moves a system of jointed levers, the last of which terminates in a hook which will catch against one of the spokes, and impede the carriage. Should the horses be running, and this piece be passed in between the spokes, there will be something more than mere impeding; the spokes must break, or the hook be bent. The claim is to "the before described method of stopping or impeding carriages." It might be added, *or of breaking wheels.*

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4. For a *Machine for Cutting Meat, Fruit, &c. into small pieces;* Joseph Buffington, Chester county, Pennsylvania, July 5.

A circular trough, having the general form of a tub, is made to receive the articles to be cut; a vertical shaft passes through its centre, upon which it is free to revolve. The cutting knives, are round plates or disks, fixed upon a horizontal shaft, which is to be turned by a winch; the disks decrease in size as they approach the centre, and the bottom of the tub rises so as to be adapted to them; this decrease in size is proportioned to the decreased circumference of the part in which they are to work. A piece of metal, with slots in it, is placed so that the knives pass through the slots, and are thus cleaned from the adhering matter. Instead of allowing the tub to revolve, it is stated that the cutting knives and frame may themselves revolve round in the tub, or trough.

The claim is to "the above described cutting knives in the form of disks, gradually diminishing in size, revolving within the tub or vessel, in which the substance to be cut is placed; and where the tub, or vessel is required to revolve, causing it to be done by the friction of the cutting knives, on the inclined bottom of the tub."

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5. For a *Press for Cotton, or other fibrous articles;* Henry L. Conner, Natchez, Mississippi, July 5.

This press is intended to operate upon two bales at the same time, the frame being made sufficiently wide for that purpose, and the whole form of the instrument being such as to cause its power to be best applied in that way.

The pressure is made by causing an endless screw to revolve vertically. This screw is of considerable length, and is fixed in the centre of the frame work of the press, so that horses, or other power, may be applied to the lever by which it is turned. A stout nut is adapted

to the screw, and rises or falls as it revolves, serving, by means of jointed levers, operating on the principle of the toggle joint, to act upon a follower. The follower is a long beam, the ends of which work in grooves in the cheeks of the press, which are at sufficient distance, on each side, from the screw, to act upon a bale of cotton placed between it and the bed. The levers which act upon the bed, are, on each side of the nut, two in number, and they may be of equal length: they are connected to each other by a hinge joint; one of them also is united to the nut, and the other to the upper beam of the press in the same way. When the nut is down upon the follower, one of the levers lies upon it, and the other against the cheek of the press; consequently, they are then at right angles with each other. To cause the jointed part to slide readily over the follower, friction rollers are employed.

A drawing would be requisite to give a clear idea of the construction of this press, which, from an inspection of the drawing and model, we thought likely to answer its intended purpose in a satisfactory manner; and we have recently, also, heard a very favourable account of its operation. It is said that with the power of one small horse 34 bales were pressed in a day, two bales being pressed at a time, so closely that 530 lbs. was contained in two feet square. Twelve bales a day is said to be fair work with the ordinary double screw press.

We apprehend that a large portion of the advantage derived from this press results from the toggle joint action. At first the cotton opposes scarcely any resistance, and the follower may then descend rapidly, which it will do by the action of the levers, whilst at the period when the greatest power is wanted, their descent is proportionally slow. There are some other presses for the same purpose, which operate upon the toggle joint principle, but whether so arranged as to produce an equally good practical result, we are not informed.

The claim is to "the manner in which the endless screw is made to operate upon the follower beam through the intervention of the nut and compound levers."

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6. For a *Reversing Side Hill Plough;* Calvin Delano, Livermore, Oxford county, Maine, July 5.

This hill side plough is made with two shares, and one mould board. The beam and handles are made to shift, as the plough is to be turned over at the end of every furrow, that the share which was upwards may enter the ground.

The manner of fixing and bracing the different parts is particularly described, but there is no claim made, the patentee supposing, probably, that the plan is altogether new; in this, however, he is entirely mistaken, as there have been hill side ploughs previously patented in which the same general principle was adopted; the present patentee ought, therefore, to have confined himself to the claiming his own particular arrangement of the parts; and it may be doubted whether even here, he would have found sufficient solid ground for his plough to stand upon.

7. For a Machine for *making Axes, Hoes, Scythes, Pitch forks,* and other agricultural implements; Luther Olds, Oneonta, Otsego county, New York, July 9.

A flatting mill of the common construction is described and represented in the drawings, excepting that the rollers are to have such indentations made in them as shall correspond with the nature of the article to be formed in them. There, however, is no information given respecting the necessary manipulation, and we are well convinced that had the patentee attempted this, he would have been much puzzled in instructing us how to roll out scythes and pitch forks in such rollers. He claims "the before described machine for making axes, hoes, scythes, pitch forks, and other agricultural implements; particularly the apparatus for bending the *poals*, or side pieces of the axe."

The machine *particularly* claimed, consists of two hinged levers, between which the *poal*, or head, of the axe, and its open sides, as delivered from the rollers, is laid to be bent so as to form the eye, and prepare it for welding the steel. When these levers are drawn up they bend the two sides together over a bar which occupies the place of the eye. The iron, we suppose, is to be made red hot, as the levers are to be drawn up by passing over pulleys.

Among the rollers represented in the drawings is one for making spoons, which we thus learn is an agricultural instrument; that is, we suppose, when used for eating hominy, or mush. At all events, rollers for manufacturing such agricultural instruments as spoons, have been known to us for forty years, and they have been several times patented. Rollers for forging a great variety of other articles have likewise been invented, reinvented, and abandoned many times over. In our last volume, p. 410, we gave an account of one for making axes in this way, and then referred to the previous patent of Mr. Asa Collins, for the same purpose..

What is meant by claiming several things generally, and then claiming one *particularly*, we do not understand; things are either new or old, claimed or not claimed; there can be no half way between these points.

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8. For a *Machine for making Cotton Wadding;* John Park and William Peck, Westmoreland, Oneida county, New York, July 10.

We are not familiar with the ordinary mode of making wadding, and cannot therefore compare the process as performed by this machine with that heretofore followed. As regards the machine itself, judging from the drawing, it appears to be well arranged, and calculated to perform the business with facility Its operation is as follows:

A lap is taken from the lap roller of a cotton carding machine, and passed between drawing rollers, in which the speed of the second pair is double that of the first. From the drawing rollers it passes between sizing rollers, which are made either of metal or stone, and extend across the whole width of the frame of the machine. The size is contained in a tub below, and is pumped up into the sizing trough, by a small

pump worked by the machinery. From the sizing troughs it is spread evenly on the rollers, and, of course, on the cotton passing between them; the sized lap then passes over conveying rollers, in a horizontal direction, where it is subjected to the action of revolving fans, similar to those used on the common dressing frame. The sheet of wadding is then conducted upwards, and returned horizontally to the front of the machine whence it descends forming a regular pile.

The claim is to "the applying and proportioning the above described machinery generally; and especially the passing the cotton between the drawing and sizing rollers in such a manner as to make a continued sheet, which is sized and dried by the operation of the same machine."

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9. For a machine for *Making Plugs and Trunnels for Ship Building;* Jesse Reed, Marshfield, Plymouth county, Massachusetts, July 22.

What are in the above title, called trunnels, are more properly treenails, which are the long wooden pins, generally of locust, used in ship building. The machine intended to be described is to be used for the rounding of these, and for the making of round plugs. The specification is not deficient in length, nor, apparently, in the attempt to afford a full description of the machinery, but we have rarely witnessed the bestowal of labour with less good effect. A drawing, with written references, does not suffice to amend the deficiences of the specification, and although we know something of machinery, and could construct one for making treenails and plugs, we should derive but little aid from the account of that before us, however much we might be inclined so to do. After this it will not be expected that we shall attempt to describe the thing; we however will give the claim.

"Your petitioner claims the general construction of said machine above described, and its application to the making of plugs and trunnels for ship building, and rollers and rounds for ploughs; excepting a tool now in use for rounding trunnels."

This exception is about as puzzling as the description itself.

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10. For an improvement in the *Cotton Gin;* James Lynch, Tuscaloosa, Alabama, July 22.

In this gin it is proposed to run more than one cylinder of saws, or pickers, similar to those used by Whitney, the number preferred being three, which are all to be cleared by one cylindrical brush, of the usual construction. The breast, or bars through which the saws work, are, in preference, made of one piece of metal, with slits cut therein; they, however, may be formed of separate bars, rivetted or otherwise joined, together. The patentee claims "the discovery that a plurality of cylinders are preferable to one cylinder, as heretofore adopted, in the picking of cotton." He also claims "the making of Cotton Gin Breasts of any form, if cast, or manufactured of one piece of metal;" and likewise "the manner of causing a band to embrace a whirl sufficiently far round to prevent the danger of slipping." We think that if the two former claims are valid, this last, taken into their company, will endanger their standing in society.

11. For a *Safety Harness;* George Rogers, city of Baltimore, Maryland, July 22.

The object of this invention is to disengage a horse, or horses, from a carriage, by loosening the harness, and allowing their escape freely therefrom; this is effected by drawing out spring keys which pass through staples, and by this means, separating the harness and the belly band. Lines lead from these spring keys to the inside of the carriage. The two parts of the harness are, at top, connected by a link, one end of which passes through a ring in the upper end of the hame, and is confined there by a spring bolt passing through a hole, or mortise; the belly band has a similar connexion. The things claimed are "the key at the end of the hame, or link of the hame; the collar cap fastened to the collar; the pad terets; the belly band made in two parts, connected together by the staple and spring key, and the mode of loosening or separating it in the centre; also the link."

Some of the parts mentioned in the claim are merely auxiliary to the general plan.

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12. For *Machinery for working of Churns;* Philo B. Pratt, Kent, Litchfield county, Connecticut, July 22.

A lever beam is to be made to work on its centre, and from each end of it is to descend a rod or pitman, attached to a crank shaft, which operates upon the dashers of churns, one being placed at each end, under the beam. A wheel and pinion, turned by a crank, are to give an accelerated motion.

This is very similar to an apparatus for the same purpose patented some time since; but not deeming either of them of sufficient importance to compare them together, we shall not undertake the task of looking at our index for the date ot the former, but leave it to those who feel some interest in the affair.

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13. For a *Rotary Steam Engine;* Edmund Perry, and Isaac N. Crosby, Rochester, Monroe county, New York, July 22.

The patentees call this "a concentric, or revolving steam engine;" and they have described and figured one of a kind which is found most numerously in books, and in the patent offices of Europe and of this country. Valves, four in number, are to shut in upon a cylinder, so as, when closed, to make a part of its periphery. This cylinder is to revolve within another, having heads, and two stops, or cams within it, on opposite sides, which close the valves "*approaching near enough to the inner revolving cylinder to prevent the escape of steam between them,*" which must be *pretty near.* The only thing about this engine which we do not now recollect to have before seen is the placing of springs under the valves to give them a tendency to rise; and the admitting of steam through holes beneath them, to increase this tendency. These parts, however, are not claimed as improvements, the whole apparatus being described, and the whole therefore, patented. If the machine was likely to answer any good purpose, the patentees might amend their specification in this particular, but as the improve-

ments will have no tendency whatever to remove the real objections to the original instrument, to induce them to do so would not be to place them in a situation to obtain value for value.

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14. For an improvement in the *Surveyor's Compass*, Julius Hanks, Troy, Rensselaer county, New York, July 22.

The sights in this circumferentor, instead of rising vertically in the usual way, are in the form of a vertical circle, furnished with slots and holes which enable the surveyor to take in elevations and depressions which cannot be sighted by the ordinary instrument. It has, sometimes, a movable limb, concentric with the vertical circle, for taking the degrees and minutes of altitude and depression; and the needle has a Vernier attached to its point, by which the surveyor can read off minutes without touching the compass. These improvements enable it to answer most of the purposes of the compass, the quadrant, and the levelling instrument.

The improvements claimed are "The circular band with the openings therein for sight and object; with the right as respects form and principle and manner of construction, of applying the same to the surveyor's compass, and all others to which the improvements may be applicable.

"The use and application of the beam as connected with bands of the foregoing description, with its fixtures and appendages, including the right of connecting an index or Nonius to either end, and a telescope.

"The use and application of a graduated scale upon the band.

"The semi-cylindric form of the cross, or covers, to the spirit levels, as herein applied to compasses of this description, as well as the manner of making them."

"And also the right, as to form or principle, of applying the Nonius to the magnetic needle, together with the sliding balance to effect and preserve the equilibrium of such needle, and all others to which it is applied."

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15. For a *Galvanic Instrument for the Cure of Diseases;* Daniel Harrington, city of Philadelphia, July 22.

(See specification.)

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16. For an *Apparatus for Straightening Clump Feet;* Gideon Goodrich, Portland Harbour, Chataque county, New York, July 22.

The apparatus here patented was contrived by the patentee to remove the distortion in the feet of one of his own children, and having found it to answer the intended purpose, he has made it the subject of a patent. The well read surgeon is aware that this complaint has been fully investigated, and that the distortion yields readily to the means of reduction which have been devised, and which appear to be scarcely susceptible of improvement. To the late eminent Professor Scarpa, of Italy, we are indebted for our accurate knowledge upon

this subject, who also devised the apparatus which, with some slight improvements, is employed by the surgeon for its cure; these facts, however, were unknown to the present inventor, and all that he has done, therefore, if not new, is so far original. The description of his apparatus refers throughout to the drawings of it, and could not be understood without them. The claim made is to the general arrangement which he has adopted; this manifests considerable ingenuity, and will probably be useful in cases and situations where a competent practitioner of surgery may not be found.

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17. For *Improvements in the Piano Forte;* Louis Fissore, an alien, who has resided two years in the United States, Baltimore, Maryland, July 22.

The improvements here patented depend principally upon the employment of cast iron to constitute a part of the frame of the instrument, the novelty in this part not consisting in the use of this material, but in the particular manner of its construction and adaptation. The turning pins are passed through a cast iron plate, and are fixed in such a way as not to depend for their tightness upon being driven in, but upon a washer passing over a square shank at the back of the plate, the pin being drawn up to a shoulder by means of a screw nut. A particular kind of tuning hammer is also employed, the key part of which is acted upon by pinions, which give to it a very slow, and consequently a powerful motion, from that of the handle.

The claims are to the manner of constructing and connecting the iron frame; the manner of fixing the tuning pins; and to the instrument for tuning, operated upon by a toothed wheel and pinions.

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18. For a machine for *Making Cordage;* John Drummond, Brooklyn, New York, July 22.

This apparatus is for doubling, twisting, and laying cordage, of various descriptions. A main shaft is to revolve, horizontally, and this carries three other shafts, parallel to itself, and sustained upon arms projecting from it. Upon these shafts are to be placed the bobbins containing the yarn. A gearing of wheel work, gives motion to the main shaft, by which the laying is effected, and also to the secondary shaft, by which the yarns are doubled and twisted. The cords are delivered through holes in the centres of the respective shafts, and the whole thus effected at one operation.

A specification for a similar machine invented by a gentleman in Philadelphia, was prepared by the Editor about seven years since, with a view to its being patented both in this country and in England; but on sending it over to the latter country, it was found that a machine operating upon the same principle was in use in the Kings rope walks at Woolwich, and in other places; the design of obtaining a patent was therefore abandoned. The resemblance between these two machines is very striking, they do not, in fact, differ in any essential feature. The same plan, as we have said, was then known in England,

and it now appears that previously to the time first named, one substantially like it had also been patented in the United States.

The claim in the present instance is to "the combination and arrangement of the several parts; particularly the hollow shafts, and the mode of communicating to them a contrary motion to that of the main shaft in forming the strands, and the mode or laying them in forming the rope," not one of which would stand the test of a critical examination, although it is probable that the patentee has truly invented all that he claims.

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19. For an improvement in the manner of *Constructing Flat Boats and Arks;* Thomas Symington, city of Baltimore, July 22.

The object in view in the above named invention is to construct boats so that they may serve the purposes of the common arks which descend rivers, and lessen the risk and avoid the loss which are sustained by the sale of the lumber after the boat is taken to pieces at its place of destination; the common ark being built of timber which is unsaleable. The means adopted consist, in part, in the addition of a temporary deck, and in a new method of attaching the boats, or arks, to each other. They are to be from sixteen to thirty feet long, and from sixteen to twenty feet wide; the sides from one to three feet high, and made of timber suitable for joist, one, two, three, or more pieces being used edgewise. The bottom is to consist of boards, or plank, in one or more thicknesses; and they, as well as the deck boards, may have shallow tongues and grooves, formed by suitable machinery. Middle sills and rafters to support the temporary deck are also made of joist stuff. The rafters are to be a little raised above the sides, and the deck plank nailed on in a temporary manner. The ends, which are hinged, are made square, but the forward and hind ends should be sloped, like those of a scow, and the whole so arranged as to injure the timber as little as possible.

Hinges, the construction of which is particularly described, are to be used to connect the boats, or arks, together, and are to be removed to be used with others. These hinges are to be placed midway between the deck and bottom of the boats, which allows them to vibrate by the agitation of the water, when much closer to each other than would be the case if the hinges were near to the top, or to the bottom.

The claim is to the above mode of constructing flat boats, or arks, by placing on them a temporary deck, in the manner described; and to the manner of hinging them at or near the middle of their square ends.

A mode of joining them by saplins, in lieu of hinges, is also described and claimed, and particular directions are given for building and launching them.

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20. For the *Application of an Elastic Spiral Spring to the Traces, Swingle Trees, or Shafts of Carriages,* to aid in overcoming the vis inertia of the load of carriages when starting; John Sherfy, Union Town, Frederick county, Maryland, July 22.

Some years ago, spiral springs were applied to the rigging of vessels for the purpose of easing off the sails when struck by sudden flaws of wind; it is to be presumed, however, that the advantages anticipated were not realized, or not to such an extent as to compensate for the additional complexity and expense, as we have never seen them in use. The springs proposed by the present patentee, are similarly constructed and applied. The spiral spring is wound with the coil open, and has a centre pin running through it, precisely like what has been called, though improperly, the spiral spring steelyard. So far as the theory of the action of the spring presents itself, it appears calculated to be beneficial when applied to harness, but we are apprehensive that the extra expense, and the liability of the springs to break, will prevent a general adoption of the plan.

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21. For a *New Musical Instrument, called the Plettro Lyra;* Phil. Trajetta, city of Philadelphia, July 22.

The instrument represented in the drawing has the general form of a violin, or viol, and has a foot by means of which it may stand vertically, the foot resting on the floor. The instrument is to be made of various sizes, five different ones being proposed, extending from that of the violin, or small size, to that of the contra basso. The inventor says that one great object of the invention was to provide an instrument to be played with the bow, and which should yet be free from those objections which exist to the violin in the hands of females, from the awkward manner in which it is intended to be held. With the Plettro Lyra, it is said, female performers may accompany and support their voices in a choir, upon a stringed instrument capable of producing long sounds, with their modifications of force. The instrument is easy to tune, and may be used for leading with all the advantages of the violin, and is, from the manner of holding it, more congenial to the dignity of the place of performance than that of the violin, even in the hands of male performers.

The strings pass over a bridge, the distance of which from the nut is short, in comparison with the body of the instrument. For larger strings this distance must be proportionably increased, and its pitch may thus be brought to that of the bass, or double bass.

"The application of short strings to a large sounding board, by inserting them in it, or suspending them over it, and giving to them a smaller relative distance from the bridge to the nut, which makes a large stringed instrument produce the high pitch of the violin, a much fuller sound, and of the kind required to perform the principal part in music," is claimed as constituting the invention.

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22. For an improvement in the *Cotton Picker and Lap Machine;* Jesse Whitehead, Godwinsville, Bergen county, New Jersey, July 22.

The improvement here patented appears to consist entirely in the application of a wheel of about thirteen inches in diameter upon the end of the lower back lap roller of a picker. The advantage derived

is said to be in the greater length of leverage to which the moving power of the gearing is applied. The wheels heretofore employed, it is said, were not larger than the rollers on the axes of which they were placed, and that they consequently worked to a great disadvantage.

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23. For an improvement in the *Stomach Pump, Cupping Instrument, and Breast Pump;* Lemuel B. White, city of New York, July 22.

We described an improvement in the injecting syringe, at p. 321 of the last volume, and the apparatus above patented appears to be much like the one there noticed, a syringe being substituted for the caoutchouc bottle. In the present instance the description is extremely meagre; the novelties are not pointed out, and there is no claim.

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24. For a mode of *Preventing the emission of Sparks from the Chimney of Locomotives or other Steam Engines;* Edward A. G. Young, New Castle; New Castle county, Delaware, July 22.

The main flue is to be covered with fine wire gauze, and there are to be four, or any other number of, additional flues, which may proceed from the upper part of the main flue, and be elbowed so as to have their mouths upwards; these also are to be covered with wire gauze, allowing the smoke to pass, and detaining the sparks.

The foregoing is an epitome of the specification of this patent, which does not make any direct claim whatever, although it may be inferred that the thing intended to be patented is the application of the wire gauze covering. The patent obtained by Mr. Espy, on the 29th of June, and published in our last number, vol. xii. p. 418, includes the use of the wove wire, in addition to a mode of increasing the draft, which appears to be absolutely necessary to compensate for the obstruction presented by the application of this reticulated material.

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25. For a *Thrashing Machine;* Benjamin Hinckley, Fayette, Kennebeck county, Maine, July 23.

This is a cylinder and concave machine, the concave being made of sheet iron, and punched with holes so as to form a grater; it rests upon wooden supports, and is borne up by springs.

The claim is to "the grater apron, resting upon springs, and applied to the cylinder in the manner described. The form and disposition of the teeth in the cylinder, and the comb, or clearer, to carry off the straw."

The teeth in the cylinder are to be of wire, about one-eighth of an inch in diameter, to project out about one-fourth of an inch, and to be one-half an inch apart; this constitutes "their form and disposition." The *comb* is a revolving piece of wood, two inches square, having teeth in it like rake teeth.

26. For a *Washing Machine;* Benjamin Hinkley, Fayette, Kennebeck county, Maine, July 28.

Three wooden rollers, having their axes parallel to each other, are to be fixed across a trough. The middle cylinder, round which the clothes are to be wound, is to be ten inches in diameter, and to be turned by a crank; the others, four inches in diameter, are to be pressed up against the middle cylinder; the crank is to be turned alternately back and forth: The claim is to these cylinders lying horizontally.

If the claim in this and the preceding patent should be found to stand the test of a fair investigation, we are no judge of likenesses; to us it appears that the things claimed resemble so closely what has been already placed in a similar predicament, as to require very nice eye to discriminate between them.

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27. For a *Plough;* Lewis Donnell, Jefferson, Richland county, Ohio, July 23.

There is but little to make known in this plough, the difference between it and others, if any, consisting in "the form of the mouldboard, the coulter, the inclination of the neck, and the manner of confining the mouldboard to the beam," these being the things claimed; but they do not appear to possess that distinctive character by which this plough can be recognized in the crowd of those deposited in the patent office.

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28. For *Portable Mead;* Jonas C. Brigham, Methuen, Essex county, Massachusetts, July 25.

This article is called portable mead, portable sarsaparilla mead, or portable chickerberry mead, according to the kind of article used to flavour it. Two pounds of honey, and two of sugar, or four of either, or eight of molasses, six ounces of tartaric, or some other acid, two drachms of essence of sarsaparilla, or any other essence preferred, two ounces of wheat flour, two ounces of cream of tartar, two drachms of salt, and water enough to make up a gallon, are to be incorporated together. When used, about two table-spoonsful of this sirop are to be put into a tumbler, which is then to be two-thirds filled with water; when on stirring in one third of a tea-spoonsful of soda powder, fermentation will take place. It is then, we suppose, to be drank; the directions, however, do not extend to this point.

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29. For *Glazing or Preparing Pelisse Wadding;* Stakeley Turner, Providence, Rhode Island, July 25.

The apparatus described in the specification is to be made of considerable length, and the fleece of cotton is to be glazed on its two sides at the two ends of the machine, which should be several yards apart. The carding machine should be in a story below that of the glazing machine, and is to deliver the fleece to be glazed, on to an endless apron, which carries it in a sloping direction up to the glazing machine;

when it arrives at one end of this it passes over a roller covered with lead, and about 15 inches diameter, which is kept revolving in a trough containing the glazing liquor, say gum water, or size. There are two small rollers 3 inches and a half in diameter, which press the fleece on to the glazing roller. From these it passes up on to another endless apron, revolving horizontally, and carrying it to the opposite end of the machine; the glazed side being upwards, and the air of the room warm and dry, the glazing is sufficiently dried in its passage, and is ready to have its reverse side glazed in a similar way, by a second trough and rollers. From these it passes on to a third revolving apron, above the latter, to the end of the machine where it received its first glazing, and where it is wound upon a suitable roller, The gearing must be such as will give the proper velocity to the respective parts.

There is no claim made, which, if the general arrangement is new, may not be a thing of importance; if otherwise, however, it might prove to be a fatal defect.

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30. For a *Machine for Manufacturing Shoes;* Solomon Gerhard, and Joseph Vanneman, Camden, New Jersey, July 26.

The machinery described in the specification of this patent is intended to enable the workman to preserve a standing or upright posture. It is ingeniously contrived and arranged, bearing in some of its parts, a considerable resemblance to apparatus for a similar purpose for which a premium was given in England, many years ago, by the Society for the encouragement of Arts, Manufactures and Commerce, although differing therefrom in its details, This machinery, though highly spoken of at the time of its invention, has never gone into use; which may be accounted for from the strong prejudices and confirmed habits of the artisans; but, possibly, experience may have suggested some other objections of which we have not heard.

The patentees, in the present case, after fully describing their machine, say "We do not claim to be the inventors of the ratchet wheels, ball and socket, clamp, or many other things which we have mentioned; but we do claim the general combination and arrangement of the various parts, for the purpose of manufacturing shoes and boots; we also claim the use of the cork for the purposes set forth, and the particular manner of opening and closing the clamp by means of a lever and inclined plane, instead of a screw and nut."

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31. For an improvement on the *Hemp and Flax Cleaner and Hackler;* Arnold Zellner, Pulaski, Giles county, Tennessee, July 26.

The machine upon which this is an improvement was patented by Mr. Zellner, on the 25th of October, 1832, and is described at p. 240. of vol. xi. The patentee states that his improvement in the cleaning part "consists in an alteration of the flue which received the tow and discharged the dust outside of the house, as specified in the original: which alteration is as follows:

"The flue rises in the same place as in the original, and takes a

curvilinear turn backwards, and discharges the tow into a closed room behind the machine. The improvement relates also to the hackling part. The hackle is cylindrical, and operates by revolving on its axle. There is a pair of fluted rollers between which the tow is passed in applying it to the hackle, which are denominated the feeding rollers. They may be made by fixing bars of iron in a base of wood, with an iron axle through the wood for the rollers to turn on; but the better way to make them is of metal, the rollers being cast iron with wrought iron axles. About two feet in diameter, and eighteen inches in length will be a good size for the hackle; the rollers may be about three inches in diameter and of about the same length with the hackle. The gearing is to be such as will move the hackle comparatively swiftly, and the feeding rollers comparatively slow. The teeth in the hackle are to be fixed into the cylinder, much inclined from a perpendicular, so that when the hackle revolves on its axle, the teeth move considerably with their points foremost."

There are directions given for the manipulating with this machine, which we omit, as they would be imperfectly understood without the drawing. The information which we have received respecting the actual use of this apparatus is very favourable, giving us good reason to believe that its operation is much superior to that of most of the machines which have been constructed for a similar purpose.

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32. For a *Mode of Applying Steam Power;* Elisha Bates, Mount Pleasant, Jefferson county, Ohio, July 27.

This patent is taken for a *new principle* of which we are told that modes of the applications are various and numerous. "It is the application of the power of steam from a cylinder and its necessary appendages and fixtures, to a *wheel*, instead of a *crank*." Several of the various modes of application are given in the specification, and one of them is represented in the drawing. In this, the piston carries a rod furnished with cogs on both sides of it, each side taking into a cog wheel, having rachet wheels so geared to it that they may carry a fly wheel in the same direction by the up and the down stroke of the piston. To the experienced machinist, we need say no more to convince him of the antiquity and inutility of the whole affair. We could fill many pages with what we know of similar attempts; but those who do not read would not buy it, and those who do have no need of it. For ourselves we seek no further to ascertain the utility of an *improvement* in the reciprocating engine, after we learn that it is intended to dispense with the crank motion; a motion upon which its useful operation is almost entirely dependent.

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33. For an improvement in the *Cotton and Wool Carding Machine;* David Adams, Richmond, Henrico county, Virginia, July 29.

The invention here claimed is the application of a second doffing cylinder to the carding machine, by which, it is said, one half more work can be done, than by a single doffing cylinder; that the work is better done, and with but little additional application of power. The single doffing cylinder, it is remarked, does not clear the main cylinder sufficiently, but leaves it much clogged with the carded fibre. The whole claim consists in the application of this second cylinder, with the requisite gearing to put it in action.

How many patents have been taken for using two doffing cylinders, we cannot say, nor is it necessary to take the trouble to ascertain it, one being as effectual as twenty, in proving that the thing is not new. We, however, could refer to four or five, one of which was patented in 1810. We had supposed the use of them to be known to every man extensively engaged in carding and spinning, and particularly to those in the woollen business. In the specification before us, cotton and wool are both mentioned, but we have heard that it was the design of the patentee to confine himself to its application in the cotton carding machine, under an idea that this new application, as he supposed it to be, would enable him to sustain a claim to a patent. This, however, cannot be done; it having been decided in court that the application of an old machine to a new purpose, is not a proper subject for a patent.

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34. For a *Mortising Machine;* Asaph Whitmarsh, East Bridgewater, Plymouth county, Massachusetts, July 30.

We shall not attempt to describe this machine with any minuteness, as a drawing would be necessary to the understanding of it. The claim made is to "the gaining or progressive motion of the chisels, and also the use of two chisels on one slider." The slider upon which the two chisels are placed works horizontally backward and forward in a suitable frame, being operated upon by a crank on a shaft with a fly wheel. The stuff to be morticed is held in a box, between the two chisels which point towards each other; there being suitable contrivances for gauging, or adapting the box to the stuff to be mortised.

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35. For an *Improved Hydrant;* Thomas W. Newton and Joseph H. Laning, city of Philadelphia, July 30.

(The specification will appear in the next number.)

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36. For a new mode of *Cleaning Wheat or other Grain;* Samuel Ellicott, Nathaniel N. Ellicott, and William Ellicott, of Ellicott's Mills, Baltimore county, Maryland, July 31.

A bed stone is made, which is surrounded by a rim of the same material, giving to it a dished, or pan-like form, the edges of the rim sloping outwards. A runner is fixed upon a spindle in the usual way, its lower side being in the form of a truncated cone, adapted for the bed stone; the runner may be raised to

any required height above the bed stone, and the grain, fed through the eye, is to be rubbed between the stones, and discharged through a hole near the bottom of the lower stone.

The claim is to "the before described modes of rubbing or cleaning grain, particularly the rim on the bed stone, to retain the grain to be submitted to the requisite degree of friction or pressure.

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37. For an improvement in the *Cap used as a Substitute for Flyers;* in what is called Danforth's filling frame; Joseph Ripka, Manayunk, Philadelphia county, Pennsylvania, July 31.

(See specification.)

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38. For an improvement in the manner of making *Keys for the Extracting of Teeth;* Cornelius Adle, Winthrop, Kennebec county, Maine, July 31.

The patentee claims "the manner of constructing the stem or beam; the manner of constructing the fulcrum, and of attaching it to the stem, and the manner of attaching the hook to the fulcrum;" but, with the exception of the first point, which consists of a bend in the shank, in which there is no novelty, the instrument is so imperfectly described, and the drawing, if drawing it can be called, so defective, that we cannot pretend to decide upon its latent merits. If the drawing with the instrument, is not more successful than the drawing of it, we should prefer the unimproved apparatus whose powers we have often essayed.

SPECIFICATIONS OF AMERICAN PATENTS.

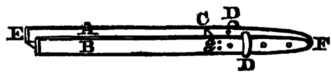
Specification of a patent for a Galvanic Instrument or Apparatus, for the cure of certain diseases in the human system. Granted to DANIEL HARRINGTON, *city of Philadelphia, July* 22, 1833.

To all whom it may concern, be it known, that I, Daniel Harrington, of the city of Philadelphia, in the state of Pennsylvania, have invented a new and useful instrument, or apparatus, for the purpose of applying the galvanic, electric, or magnetic fluid, or influence, as produced by the contact of different metals, to the cure of certain diseases in the human system, and that the following is a full and exact description of the construction of, and the modes of operating with, the said instrument, or apparatus.

Any two different metals which excite the galvanic influence by contact, may be used in the formation of this instrument, but I prefer for this purpose silver and zinc, and shall speak of them only, therefore, in my description. The instrument is intended to be applied to the different external orifices of the human body, as to the anus, the vagina, the nares, and the meatus auditorius, or orifice of the ear, for the removal of obstructions, and the cure or relief of such diseases as may be beneficially treated thereby. The particular instrument

which I am about to describe is of a size and form which adapt it to the rectum, in the adult subject; those used for the nostrils, or other purposes, must, of course, be so varied in form and size as shall be best suited to the purpose, the general principle of their construction being in all cases similar; they must also be suited in size to the age, or other circumstances of the patient.

The accompanying drawing represents the instrument of two-thirds the full size of one which I have had in actual operation; it consists, principally, of two pieces of metal, separated by a bad conductor of electricity. A and B are the two pieces of metal, each made in the



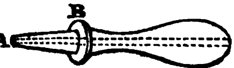
same form; C is a piece of ivory, glass, resin, or any other bad conductor of the electric fluid. D D, are flanches, collars, or projecting plates, of metal, which stand at the distance of about two inches from one, and five from the other, end of the instrument. The nonconducting piece C, may be about one-fourth of an inch thick, and from two to three inches long; its width must be equal to that of the pieces of metal between which it is interposed. The general width of the pieces of metal A and B, is about half an inch, and their greatest thickness is about one-eighth of an inch. The silver should be made much thinner, say one thirteenth of an inch thick, for three or four inches in length, towards the end E, in order that, by its elasticity, the two metals may be readily brought into contact with each other. The end from D to F is to be nicely rounded, and tapered, as it is to be inserted into the rectum, and the faces of the collars, or flanches, towards that end, should be somewhat convex, and perfectly smooth, that it may press, without producing inconvenience, upon the delicate membrane which surrounds the anus. *a a a* are rivets, or pins, of wood, which pass entirely through the two thicknesses of metal, and the nonconductor, to connect them together, cement also being interposed between the metals and the ivory, to promote the same end. Screws of metal may be used for the same purpose, provided they do not pass entirely through the nonconductor.

When this instrument is used, it should be dipped into olive oil, and then inserted by a gently twisting motion, until the flanches bear against the membrane, in which position it is to be held whilst it is in use. In order to produce the desired influence, the silver and zinc are to be alternately pressed together, and suffered to recede; a succession of slight, though perceptible, shocks, will be thus produced, and it will rarely happen that the application of the instrument in this way will not produce a dejection, even in cases where the constipation has been obstinate. Experience has shown that instead of the debilitating effects of ordinary cathartics, this application tends to give tone to the intestinal canal, and in this way to produce very happy results in cases of dyspepsia, habitual costiveness, and other complaints. By keeping the two metals in contact, a continued in-

fluence will be produced, and this, when desired, may be increased by the use of a small galvanic pile, or battery, the poles of which may be connected with the respective metals; for ordinary purposes, this, however, is not necessary.

As an *appendage* to this instrument, when used for operating through the medium of the rectum, I sometimes employ another, which, for an adult, may be in form such as is represented in the

B

A 

C

accompanying figure. This appendage may be turned out of ivory or hard wood, or it may be blown out of glass. The end A may be inserted in the same way with the end F, of the first named instrument; the collar, or flanch, B, serving to regulate it in the same way with the metal collar, D. The handle part, C, may be of any convenient form. This appendage I perforate from end to end, as shown by the dotted lines. It will be found convenient, sometimes, to use this as introductory to the galvanic instrument, or, occasionally, after it, or alternating with it. By means of the perforation, a syringe, or injecting pipe, adapted to the larger end of the perforation, may be used to inject oils, or other fluids, which, from a diseased state of the rectum, or from other causes, may be required.

I am aware that galvanic circles have been, and are now, employed in different ways, as by inserting a small cylinder of zinc in the rectum, and a piece of silver in the mouth, with a connecting wire of silver between the two; and also by binding plates of zinc and silver on different and distant parts of the body, after removing the cuticle, and connecting such plates by a wire, as above; thus keeping up a continued action of the galvanic influence, or an action of many hours duration; I do not, therefore, claim the application of such instruments; but what I do claim as my invention is the employment of two metals, with a bad conductor of electricity interposed between them, in the manner, or upon the principle, herein described, for the purpose of producing for a shorter or a longer period, a succession of gentle shocks, for the purpose of removing obstructions, or of producing other beneficial effects, in cases of diseased action, by inserting and using the same as directed, in any of the external orifices of the human body.

DANIEL HARRINGTON.

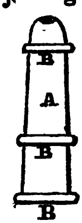
Specification of a patent for an improvement in the Cap used as a substitute for Flyers in Danforth's Spinning Machine. Granted to JOSEPH RIPKA, *Manayunk, Philadelphia county, July* 31, 1833.

To all whom it may concern, be it known, that I, Joseph Ripka, of Manayunk, in the county of Philadelphia, and state of Pennsylvania, have invented an improvement in the cap used as a substitute

for flyers in what is called Danforth's filling frame, and that the following is a full and exact description thereof.

The cap which I use is made in the same general form as that employed by Danforth, but instead of leaving the outside of the cap of a plain continuous surface, I form thereon three or more beads, fillets, or rings, which rise a sixteenth of an inch, more or less, above the general surface of the cap. When I use three only of such rings, I form one of them on the lower end of the conical cap, another on the upper end, just where it begins to curve in towards the spindle, and the third about two-fifths of the distance between the two former, measuring from the lower edge; the precise situation, however, is not a point of importance.

In the smooth cap, without projecting rims, an attraction, or adhesion, of the thread to the surface of the cap takes place in certain states of the atmosphere, occasioning great difficulty in the spinning, and a frequent breaking of the thread, which evils are obviated by the projecting rims above described.



What I claim as my invention, and for which I ask a patent, is the formation of three or more projecting rims upon the cap used in Danforth's spinning machine, in the manner, and for the purposes herein described,

JOSEPH RIPKA.

A. The cap.
B. Rings, or fillets.

ENGLISH PATENTS.

Specification of a patent granted to GEORGE FREDERICK MUNTZ, *Metal Roller, for an improved manufacture of Bolts, and other, the like, Ship's Fastenings. Dated December* 17, 1832.

To all to whom these presents shall come, &c. &c., now know ye, that, in compliance with the said proviso, I, the said George Frederick Muntz, do hereby declare the nature of my said invention* to consist in making the said bolts, and other, the like, ship's fastenings, of an alloy of zinc and copper, in such proportions, and of such qualities, as while it enables the manufacturer to roll and work the said compound metal into bolts, and other, the like, ship's fastenings at a red heat, and thus makes the said bolts, and other, the like, ship's fastenings, less difficult to work, and, consequently, cheaper to manufacture, renders the said bolts, and other, the like, ship's fastenings, less liable to oxydation, and consequently, more durable than the ordinary bolts, and other, the like, ship's fastenings now in use. And in further compliance with the said proviso, I, the said

* In vol. xii. p. 195, we gave a short notice of the specification by the same patentee, for making plates for sheathing ships. Our readers will perceive that the present patent is for the application of similar materials for making the bolts and fastenings.

George Frederick Muntz, do hereby describe the manner in which my said invention is to be performed, by the following statement thereof, that is to say:

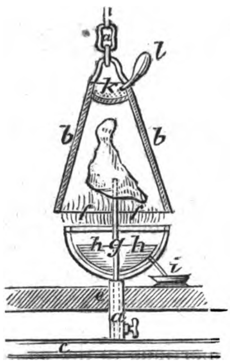
I take that quality of copper known in trade by the appellation of "best selected copper," and that quality of zinc known in England as "foreign zinc," and melt them together in the usual manner in any proportions between fifty per cent. of copper, to fifty per cent. of zinc, and sixty-three per cent. of copper to thirty-seven per cent. of zinc; both of which extremes, and all intermediate proportions, will roll and work at a red heat; but as too large a proportion of copper increases the difficulty of working the metal, and too large a proportion of zinc renders the metal too hard when cold, I prefer the alloy to consist of about sixty per cent. of copper to forty per cent. of zinc: this compound I cast into ingots of any convenient weight, and then heat them to a red heat, and roll or work them while at that heat into bolts, and other, the like ship's fastenings, in the same manner as copper is rolled or worked, but only taking care not to overheat the metal so as to produce fusion, and not to put it through the rollers, or work it, after the heat has left it too much, say when the red heat goes off. Now whereas it is evident, that the said alloy may also be made from a compound of copper and calamine by cementation, taking care that the quantity of calamine shall be such that the zinc extracted from it will be in some of the same proportions to the copper as before mentioned; but as it is very difficult to make the copper take up the necessary quantity of zinc by this process, it is more expensive. It is equally evident that brass of very good quality, with the addition of zinc requisite to make the proper proportions of copper and zinc, will likewise roll and work hot, and answer the purpose, but is again a more expensive mode.

And whereas I claim as my invention, the manufacture of bolts, and other, the like, ship's fastenings, of an alloy of copper and zinc, as aforesaid, in such proportions as will enable the manufacturer to roll or work the said alloy while at a red heat, into bolts, and other, the like, ship's fastenings, which are more durable and more cheaply manufactured than copper bolts, at the same time that they are less liable to corrode; and such my invention being, to the best of my knowledge and belief, entirely new, and never before used within that part of his said Majesty's United Kingdom of Great Britain and Ireland, called England, his said dominion of Wales, or Town of Berwick-upon-Tweed, I do hereby declare this to be my specification of the same, and that I do verily believe that this my said specification doth comply in all respects, fully, and without reserve or disguise, with the proviso in the said hereinbefore in part recited letters patent contained, wherefore I do hereby claim to maintain exclusive right and privilege to my said invention.

[*Rep. Pat. Inv.*

To ROBERT HICKS, *Surgeon, for his invention of certain improvements in Culinary Apparatus. Sealed July* 6, 1831.

The object of this invention is to roast meat by the heat emitted from the flame of ignited gas, that heat being confined under a conical cover which is placed as a screen above a circular burner, and the meat to be cooked is mounted upon a vertical spit in the centre of a circle of gas flame.



The annexed figure represents one of the apparatus, the gas burner and the conical cover being shown in sections. Several of these apparatus of different sizes are proposed to be adapted to a table or a dresser in a kitchen, and it is deemed most adviseable that the dresser should be placed within a recess, for the purpose of confining the heat, and that a pipe from a hood above should take off the steam, and other vapour, into the kitchen chimney or into the open air.

A chain, *a*, is passed over a pulley above, fixed in the ceiling, if convenient, from one end of which chain the conical cap, or cover, *b*, is suspended, and at the other end of the chain a balance weight is attached.

A pipe, *c*, conducts the ordinary illuminating gas, and from the upper side of this pipe any desired number of branch pipes, as *d*, may lead off.

These branch pipes, furnished with stop cocks, are intended to pass through a dresser or table, as *e*, and above the dresser, the pipe divides into arms, which conduct the gas to the annular burner, *f f*, the burner having perforations cut round its outer rim.

A rod, *g*, is placed perpendicularly in the centre of the burner, upon which a joint of meat, intended to be roasted may be spitted, and a basin, or dish, *h*, is also mounted within the ring to receive the dripping and gravy, which may be allowed to run off through a pipe into a basin *i*.

When the meat to be roasted has been thus spitted, and the gas in the circular burner lighted, the conical cap or cover is then let down over the meat, as shown in the figure, which confines the heat of the flame, and the reflection from the inner surface of the cone roasts the meat in a very equal and perfect manner.

In order to baste the meat without removing the cap or cover, a perforated dish or colander, *k*, is made in the upper part of the cone, into which the fat, or other basting materials, may be introduced by a broad funnel, *l*, extending on the outside of the cone; the dripping for basting being taken by a spoon from the basin, *i*, and poured into the funnel, *l*, as it may be required.

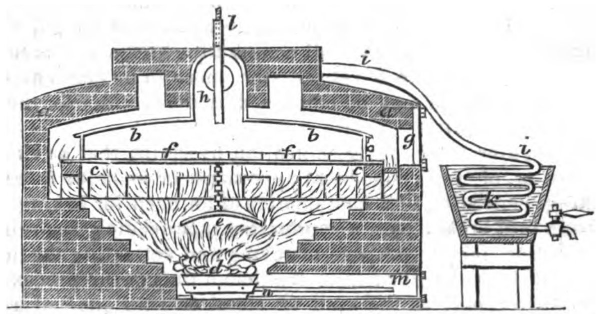
The patentee says, in the conclusion of his specification, I claim as my invention the improvements hereinbefore described, as applied

to culinary purposes, and such my invention being, to the best of my knowledge and belief, entirely new, and never before used, &c.

[*Lond. Jour.*

To Robert Hicks, *Surgeon, for his having invented, or found out, an economical apparatus or machine, to be applied in the process of baking, for the purpose of saving materials. Sealed June* 26, 1830.

This invention is stated to consist in the combination of an oven for baking fermented dough into bread, with a conducting pipe and refrigerator or condensor, which shall receive and condense the steam and alcoholic vapour emitted from the bread while baking. There is no peculiar feature of novelty in the form or construction of the oven, excepting that it is proposed to be of iron, and to have an outlet at the top for carrying off the steam and vapour. It is particularly expressed, that the invention applies solely to the baking of *fermented* dough, and not to the baking of other kinds of dough, as biscuits and pastry, which have not been fermented.



The construction of the oven proposed by the patentee, is shown in the annexed section. *a a*, is the brick-work forming the outer casing of the furnace and flues; *b b*, is a close box of iron, of an eliptical shape, which is to constitute the oven. This is supported by the edges of the bottom plate bearing upon the rim of brickwork *c c*.

The fire is not to be placed within the oven, but in the furnace, *d*, below, and the oven is to be heated by the flame and smoke passing upwards from the furnace to the under surface of the bottom plate, and through the apertures in the rim of brickwork, *c*, to the channel round and over the top of the oven, from whence the smoke ultimately escapes by a chimney.

A shield, *e*, is suspended from the bottom plate over the centre of the furnace, in order to prevent the heat of the fire acting with too great a degree of intensity in the middle of the oven. By means of this shield, the heat is more equally distributed over the bottom of the oven.

The bottom of the oven is covered with fire bricks, *f f*, and dough is introduced into the oven, and removed from it when baked into bread, at the door *g*, which, when closed, is intended to be air tight at its joints. The steam and vapour as it arises from the baking dough,

ascends into the recess *h*, and passes off by the pipe *i i*, to a refrigerating worm in the tub *k*, where the vapour becomes condensed, and may be drawn from the worm by a cock at its lower extremity.

In order to ascertain the temperature of the oven, a thermometer, *l*, is inserted in a tube, extending downwards from the top of the recess *h*, and it is stated that the proper heat of the oven, when in operation, should be from 280° to 310° Fahrenheit.

The fuel is to be fed into the furnace, and ignited through the ash pit *m*. It is proposed, that a basket grate be employed, and that it be slidden in and out upon the horizontal bar *n*, the air being supplied to support its combustion from the opening in front of the ash pit.

Another mode of supplying the furnace with fuel, and of heating the oven, is proposed, which is, by carrying the furnace round under the oven upon a rotary horizontal frame made to revolve by means of bevel gear beneath, in a similar way to Brunton's plan of constructing furnaces for steam engines, and feeding them with fuel from a hopper.

It is, however, to be observed, that any peculiar construction of furnace, or oven, forms no part of this invention, but that it consists solely in connecting an oven for baking fermented dough, with a refrigerator, by a pipe which shall conduct the steam and alcoholic vapours from the oven to a refrigerator, there to be condensed into a diluted spirit, which may be employed by the rectifier for the production of a pure spirit.

The patentee closes his specification by saying that he claims to be the inventor, of "an economical apparatus, or machine to be applied to baking, consisting of a combination of an oven for baking fermented dough into bread, with a conducting pipe leading to a refrigerator or condensor, for the purpose of saving and collecting the liquid materials which are evolved from the dough during the process of baking, whatever may be the kind of metal or substance of which the oven is made."

Remarks by the Editor of the London Journal of Arts and Sciences.

We subjoin the following remarks upon the above invention, extracted, by permission, from a work by James Jennings, Esq. now in the press, entitled, "The New Family Cook," in which, under the article *bread*, the author says: "Concerning the heat necessary to be employed in an oven for baking bread, (which is said to be 450,° as usually practised by bakers,) it may here be observed, that if what is stated in the specification of Hick's patent be true, and we see no reason to doubt it, it is evident that the degree of 450 is by far too much. It must be remembered, however, that when an oven is heated to this high temperature, the fire is wholly withdrawn, and consequently from the moment of its withdrawal, the heat gradually declines; but, in the baking of metropolitan bread, as practiced by the company formed under this patent, the heat is, we presume, constantly kept at the same degree, or nearly so, and consequently insures not only a more complete baking of the bread than in ordinary ovens, but the most effectual disengagement of the alcohol, &c. We see every thing to commend in this process, and recommend this plan

of the equalization of heat during the whole time that the bread is in the oven to the attention of bakers generally."

The author adds, on the subject of kneading—"From what has been observed, concerning the metropolitan as well as French bread, we are decidedly of opinion that the ordinary bread every where to be met with in this country is *too much kneaded*, and in consequence is less raised than good and wholesome bread ought to be. It is evident that if bread be kneaded just before it is put in the oven, as ordinary bread is, by rolling, as well as otherwise, some of the gas to which its porousness is owing must escape; while, on the contrary, the French bread, and we conclude the metropolitan bread, baked in tins, does not undergo the last process of kneading and rolling, which common bread does; and hence, the superior wholesomeness of these breads when well baked, to the ordinary bread of the shops.

"It is not meant by these observations that the dough is not to be kneaded at all, far from it: when the water and other ingredients necessary for forming the flour into dough, are added, the mass should be well kneaded in order to their complete mixture; but afterwards, when the fermentation has begun, all further kneading should as much as possible be avoided: where spirit is to be obtained from the bread, this is of the utmost importance." [*Ibid.*

Specification of a patent granted to JOHN HOWARD KYAN, *Esq., for an improved mode of preserving Paper, Canvass, Cloth, and Cordage for Ships and other uses; and the Raw Materials of Hemp, Flax, or Cotton, from which the same may wholly or in part be made. Dated September* 22, 1832.

To all to whom these presents shall come, &c. &c., now know ye, that in compliance with the said proviso, I, the said John Howard Kyan, do hereby declare the nature of my said invention to consist in steeping the several manufactures and materials, hereinbefore specified, in a solution of deutochloride of mercury in water. And in further compliance with the said proviso, I, the said John Howard Kyan, do hereby describe the manner in which my said invention is to be performed, by the following statement thereof, that is to say:

Having prepared or constructed a large tank or reservoir of wood or other suitable material, I fill it about two-thirds full of deutochloride of mercury, or, as it is more commonly called, corrosive sublimate, dissolved in hot or cold water, in the proportion of one pound of the sublimate to five gallons of water; and into this liquid I put the said manufactures and materials hereinbefore specified, and, keeping them completely covered by the liquid, steep them, for various periods, according to the nature and substance of the manufacture or material, the object being, that a complete saturation should take place;—thus, for instance, a thin piece of calico cloth may be left in the liquid for one day, while a thick piece of canvass may remain a week, and cordage proportionably longer: the raw materials also will

be subject to the same rule of complete saturation. When removed from the tank or reservoir, the manufactures or materials should be first thoroughly dried, and then may be washed in any number of waters, hot or cold, to remove any portion, in excess, of the deleterious matter which may be supposed to remain in them, for the action of the deutochloride having once taken effect upon the matter which promotes decay, a chemical change is effected in it, which no subsequent washing can destroy, and which renders the longer presence of any deleterious matter quite unnecessary.

Now whereas I claim as my invention, the preservation of paper, canvass, cloth, and cordage, for ships, and other uses, and also the preservation of the raw materials of hemp, flax, or cotton (from which the same may wholly, or in part, be made) from decay, by immersing and steeping, or saturating, the same in, or with, a solution of corrosive sublimate in water, and thus submitting that matter contained in the said manufactures and materials which most promotes decay, to the action of deutochloride of mercury as hereinbefore described. And such my invention being, to the best of my knowledge and belief, entirely new, and never before used within that part of his said Majesty's United Kingdom of Great Britain and Ireland, called England, his dominion of Wales and town of Berwick-upon-Tweed, nor in any of his said Majesty's colonies or plantations abroad, I do hereby declare this to be my specification of the same, and that I do verily believe that this my said specification, doth comply, in all respects fully, and without reserve or disguise, with the proviso in the said hereinbefore in part recited letters patent contained, wherefore I do hereby claim to maintain exclusive right and privilege to my said invention. [*Rep. Pat. Inv.*

¶ *Facts relating to Mr. Woolf's Invention of applying High-pressure Steam Expansively. Extracted from Mr. Farey's Evidence before the Select Committee of the House of Commons in* 1829, *on the Law relative to patents for Inventions, printed in the Report of that Committee.*

Continued from Vol. XII. p. 354

The specification to Mr. Woolf's patent of 1804* claims the improvement of working steam engines by high-pressure steam, acting expansively, either in one or in two cylinders, and describes the structure and mode of operation of engines of both kinds. It was at that time quite a new proposal, but the general opinion of engineers was very unfavorable to it.

* Printed in the Philosophical Magazine, vol. xxiii. p. 335, or Repertory, second series, vol. vi. p. 84. The system of working expansively with steam of the ordinary atmospheric elasticity was invented by Mr. Watt, who had a patent for it in 1782; he proposed to do it in one cylinder, and executed it with success. Mr. Hornblower proposed to do the same in two cylinders, and had a patent in 1784: but that plan did not in practice prove so advantageous as Mr. Watt's with one cylinder, and never came into use.

In the course of four or five years, Mr. Woolf made a few small rotative engines in London, some with two cylinders, others with one, but he met with no encouragement, and lost much money; until 1811, when he had brought his small rotative engines, with two cylinders, to such perfection, that on a well attested trial of a nine-horse engine and corn mill, it ground 17½ bushels of wheat by the consumption of one bushel of coals; and on a repetition of the trial, nearly 20½ bushels. Mr. Watt's rotative engines of that power will not do half so much.

From that time there has been a demand for Mr. Woolf's rotative engines with two cylinders, and a great number have been made: they have answered very well, and, on an average, consume only half as much fuel as the average of Mr. Watt's engines, exerting the same power. About 1813 Mr. Woolf obtained encouragement in Cornwall, and went to reside there; his partner, Mr. Edwards, continued the business by himself in London. In 1815 Mr. Edwards took out a patent in France, and sent over some engines, which were so much approved that he was induced to remove to Paris, where he has since made a great number of Mr. Woolf's engines. Also about the time that Mr. Edwards went to France, Mr. Hall began making Mr. Woolf's rotative engines with two cylinders, at Dartford, and has executed a great many excellent engines; most of them have been sent to France, where Mr. Woolf's engines are very common, and are greatly preferred to any others. Mr. Hall continues the business on an extensive scale.

Mr. Woolf's first engines for pumping water from mines were set up by him in 1814 at Wheal Abraham and at Wheal Vor mines in Cornwall; they had each two cylinders; their performance far exceeded that of any steam engines ever made before. In the latter half of 1815, the two engines raised, on an average, 48 million pounds of water one foot high, for every bushel of coals they consumed. Thus:

Engines.	Half of 1815.	1816.	1817.	1818.
Wheal Abraham*	48.63	49.71	44.07	36.91
Wheal Vor......	47.63	44.23	36.15	29.33
Average	48.13	46.97	40.11	33.12

* Wheal Abraham engine raised 56.92 millions, on the average of all the month of May, 1816. In 1818, this engine was put in order, and exact trials of its performance were made by Mr. Farey, with the steam kept up to a greater elasticity than usual, and acting with a greater extent of expansion than usual; it then raised 65.22 millions, on the average of two trials of eight hours and six hours each: that was the greatest effect ever produced by steam, until November, 1827, when Woolf's engine at the Consolidated Mines raised 67.10 millions, on the average of the month's working.

The steam cases for the cylinders of these engines were exposed to the open air without any clothing. See a description of the cylinders, Philosophical Magazine, vol. xlvi. pp. 116, 236, 319, and 398; and the performance for each month is stated in the numbers of the succeeding volumes up to the end of 1818.

To estimate the improvement thus effected by Mr. Woolf, by himself alone, without aid from any other engineers, and whilst he was opposed by many, the performance of the engines previously used in Cornwall must be examined.

Mr. Watt first introduced his engines into Cornwall in 1778, in place of Newcomen's atmospheric engines, which had been introduced there about fifty years before, but had never raised more than eight or nine millions. Mr. Watt did twice as much with his first engines, and three times as much, after he had applied his method of working expansively, for which he had a patent in 1782. It consists in stopping the supply of steam from the boiler to the cylinder, when the piston has only moved through a portion of its course, leaving it to be impelled through the remainder, by the expansive action of the steam already admitted into the cylinder, without any further expenditure of steam from the boiler.

Mr. Watt proposed, in 1782, to work his engines by stopping the supply of steam when the piston had only moved one fourth of its course, leaving three-fourths of its course to be performed by the expansive action; and although the force exerted by the steam during that expansion must continually decrease, nevertheless $2\frac{1}{3}$ times more power would be exerted on the whole than would be exerted by the same steam, if it acted without expansion. But it was found that such an extent of expansive action could not be realized in practice, because the steam used by Mr. Watt, when expanded to fill a quadruple space, becomes too feeble to impel a piston with effect.

Mr. Watt never retained the steam in his boilers much above the pressure of the atmosphere; they were always supplied with water through upright pipes, open at top to the atmosphere, and the lower ends immersed beneath the surface of the water in the boilers; the open ends of the feeding-pipes being only eight feet high above that surface, the steam could not by any chance be retained in the boiler beyond $3\frac{1}{8}$ pounds per square inch, more elastic than the atmospheric air: that was Mr. Watt's practice, and his successors in business at Soho, still continue it. The term low pressure steam, can only, with propriety, be applied to the steam produced by such boilers.

Mr. Watt's engines with such boilers, cannot be made to exert a competent power to drain deep mines, unless the supply of steam to the cylinder is continued, until the piston has run through more than half its course; and, on an average, in practice, low-pressure steam is only expanded so much, as to fill one and a half time the space it occupies in the cylinder, at the moment when the supply was cut off: even with that moderate extent of expansive action, the steam will exert nearly one-half more power than would be exerted by the same steam acting without expansion, as it must do, if the supply from the boiler to the cylinder were continued until the piston terminated its course.

Mr. Watt's engines, well constructed and well managed, will raise twenty-five millions for an average. They are still the only

engines used in London for water-works, and in many districts for draining mines, they were the only engines used in Cornwall in 1814, when Mr. Woolf set up his first engines there. Under favourable circumstances, such as having little work to do, keeping up the steam as strong as can be retained in the boiler without overflowing the feeding pipes of eight feet high, and working with the utmost extent of expansive action that those circumstances will allow, using good coals, clean water, plenty of cold condensing water, and the boiler, cylinder, and steam-pipes being properly clothed,—a well constructed engine of Mr. Watt's may raise thirty two millions; but that is the utmost, and cannot be maintained in regular working. On the other hand, a number of engines working incessantly at deep mines, under ordinary management and average circumstances, will not reach twenty millions, as is shown by the following account of the average performance of the engines in Cornwall, in 1813 and 1814, when they were all worked on Mr. Watt's system of low-pressure steam acting expansively in one cylinder.

Date of Year	Aggr. of the Engines in Cornw.				Aver. per Engine.		Annual Performance of the best Engines. Millions.
	No. of Engines	Aver. Mills.	Bushels per Ann.	Horse Power.	Bushels per month.	Horse Power	
1813	24	19.38	770076	861	2672	35.9	26.65
1814	29	20.37	1002563	1176	2880	40.5	31.99
1828	56	373.3	1165866	2508	1735	44.8	77.29
1829	53	412.2	985435	2342	1550	44.2	76.23

In 1813, the highest performance attained by the best engines on Mr. Watt's system did not reach thirty millions and the performance of the engines averaged less than twenty millions; but in 1829, when all the engines were worked on Mr. Woolf's system of high pressure steam acting expansively in one cylinder, the best of those engines averaged seventy-six millions, and the whole number (being more than twice as many as in 1813) averaged forty-one millions.

The great cause of the superiority may be thus explained; Mr. Woolf's engines are worked by high-pressure steam, which is retained in the boiler to an elasticity of between twenty-five and forty-five pounds per square inch more than the atmospheric air. Steam of that elasticity may be expanded to fill between five and eight times the space it occupied when first admitted from the boiler into the cylinder; and yet it will have a sufficient force to impel the piston with as much effect, during all that great extent of expansive action, as can be done in Mr. Watt's engines when the expansion is only from one space into two; hence Mr. Woolf's system renders the expansive action available to a greater extent than can be done in Mr. Watt's system. There are other concurrent causes for the great superiority, but that is the principal cause.

In his specification of 1782, Mr. Watt proposed to use steam equal to the atmosphere, with a far greater extent of expansive action than he or his successors have been able to realize in practice; and so Mr. Woolf, in his specification of 1804, proposed to carry the expansion of high-pressure steam to a far greater extent than has ever been executed by himself or others.*

When Mr, Woolf began, it was a common notion that mere variation in the elasticity of the steam employed, could no way affect Mr. Watt's invention of expansive working, and that the use of high-pressure steam, as proposed by Mr. Woolf, could never be advantageous. Such notions continued current, until he proved their fallacy by the great performance of his engines: but he did not attain that proof without exertion, for the difficulties of carrying his invention into effect were very great, and cost him some years of uninterrupted labour and great expense to overcome them. He encountered much active opposition from those who had made up their minds on his first proposals; and their unfavourable opinions prevented him from getting orders for any large engines until 1813.

The value of the improvement which Mr. Woolf made in the performance of engines, before his system was adopted or countenanced by other engineers, may be stated as follows. In 1814, the average performance of the twenty-nine engines that were reported, was 20.37 millions, and their consumption of coals was 1,002.563 bushels. The price of coals being at that time 14½*d.* per bushel, the cost of coals was 60,570*l.* per annum, or 2088*l.* per annum for each engine, on an average.

The average performance of Mr. Woolf's engines at Wheal Abraham and Wheal Vor, during the three years and a half above cited, was 42-08 millions, or more than double the average of all Mr. Watt's engines in 1814; hence if all those engines had been replaced by engines such as Mr. Woolf had then made, more than half the expense of coals would have been avoided, being a saving of 29,300*l.* per annum to the mine adventurers; or at the rate of full 1000*l.* per annum saved in working each engine, on an average of the whole number, each engine exerting about forty horse power.

The expense and complication of Mr. Woolf's engines with two cylinders being found objectionable, he altered an old Watt's engine at Wheal Abraham in 1816, to work by high pressure steam, with an increased extent of expansive action, in one cylinder; and the improvement in its performance proved that two cylinders

* If it is represented as a failure, that Mr. Woolf did not accomplish all that he anticipated, in 1804, still that is no reason for overlooking what he did accomplish by himself in 1811 and 1815, or how much he then surpassed all that had been done before: nor can any such imputation of failure justify the omission of his name by those writers who undertake to state the extention that has been given to Mr. Watt's discovery of expansive working, by using high pressure steam; for that extension is not due to Mr. Watt in any part, but to Mr. Woolf entirely.

are not essential to the successful practice of his system.* He altered another old engine at Wheal Unity, by adding a small cylinder to it; the performance was improved in about the same degree as that of the old engine with one cylinder.

[TO BE CONTINUED.]

¶ *Report of the Board of Examiners, appointed by the Connecticut River Steam Boat Company, to inquire into the causes of the Explosion of the Steam Boat New England, which occurred at Essex, October 9th,* 1833.

The undersigned, having been requested to examine the remains of the Steam Boat New England, and to make inquiries with a view of ascertaining the causes which led to the disastrous explosion on board of that Boat, respectfully REPORT.—

That on the 7th of November, we met at the borough of Essex, and proceeded to examine the present state of said boat, and the remains of the boilers. On visiting the steam boat, we found that those portions of the guards and railing, on which the boilers had been placed, together with the boiler houses, railings, and the other contiguous wood work, had been entirely destroyed by the effects of the explosion. The front of the ladies' cabin upon the quarter deck, had also been forced inward, and partially destroyed, and that part of the upper, or promenade deck, which extended from said cabin to the engine room near the centre of the boat, had been swept entirely away. The engine remained without injury; but the steam pipe which led from one of the boilers, was broken off at its junction with the main steam pipe in the engine room, near the point where it unites with the steam pipe from the starboard boiler. The *safety valve*, which is attached to the main steam pipe at the junction of the two branch pipes, near the engine, remains unimpaired, and is a large, and apparently well constructed, valve. A mercurial *steam gauge* is attached to the main steam pipe at this point, which serves to indicate to the engineer the pressure of steam in the boilers. The mercury was not thrown from this gauge by the explosion, and the gauge remained in good order after the accident. Two other mercurial gauges of the same description were shown to us, which had been attached one to each of the boilers, on that part called the steam chimney, which having no water in contact with its inner surface, becomes heated more than any other portion of the boiler. These gauges had been torn from their places at the time of the explosion, and in one of them a portion of the mercury with which it had been charged, was found remaining after the accident. It was ascertained on admeasurement, that these steam gauges were calculat-

* The same fact had been ascertained years before, in respect to Watt's system of working expansively by low-pressure steam; for Mr. Hornblower, who practised that system in two cylinders, did not succeed so well as Mr. Watt himself, who only used one cylinder.

ed to resist a pressure of about 32 pounds to the inch without discharging the mercury. Near the lever of the safety valve, which is inclosed in a small room on the upper deck, is a thin board partition inclosing the engine, a small portion of which had been moved from its temporary fastenings, and had been permitted to fall back into a slightly inclined position, which brought it in contact with the weights of the safety valve, at a point below the centre of the partition. This part of the partition, or bulk head, was in the form of a battened door, of the height of seven feet, and could fall no further from its place than to bring its top against a small beam, or carlin which crossed at the distance of fourteen inches from its perpendicular position. It does not appear that this door-like portion of the partition was in contact with the valve weights at the time of the accident; but, in order to ascertain the effect which, in any possible case, it might have upon the safety valve, several experiments were made, in which it appeared that no perceptible resistance to the raising of the valve resulted from this source. Nor was the resistance to the rising of the valve much increased, by the force of one man applied in drawing the door into firmer contact with the weights; and with the united force of two men, thus applied in the impingement, there was no difficulty in raising the lever with the hand. No importance therefore can be attached to the circumstances of this partition, even had we not obtained evidence, as we afterwards did, that the door was in its perpendicular and proper position on the morning after the accident. We may add, that no obstruction of this kind could have prevented the action of the three mercurial gauges, which, by blowing off the mercury when the pressure exceeds a certain point, may, (when not charged beyond the point of safety,) be considered as cautionary safety valves of the most perfect character.

The mutilated portions of the *boilers* which were examined, gave abundant evidence of the great power or force of the explosive action. The material was rolled copper of the usual thickness. The original form of each boiler* was semi-circular, with extended sides, the latter descending perpendicularly; and uniting at bottom with similar extensions of two inferior arches which severally formed the roofs of the two furnaces or main flues, that extended longitudinally through each boiler. The interior extension of these arches also descended, in two parallel sides, to the bottom of the boiler, forming, like the two sides of the boiler, what is technically called a *water-leg*. These parallel or flat sides, as well as the middle leg, were connected at distances of nine inches by copper bolts of seven eighths of an inch in diameter, which passed through the sides, and fastened the internal to the external plates or surface of the water legs, the space remaining between which, for the reception of the water, was from three to four inches. The arches or roofs of the furnace flues, were also connected

* See the annexed figures.—pages 58, 59.

by long brace-bolts, and other fastenings, to the upper parts of the boiler as a further security against the downward pressure to which the arches are subject. Above these arches, in the interior of the boiler, were placed five round *flues*, surrounded by the water, and extending longitudinally through the boiler on a horizontal level. The fire, after passing under the arches through nearly the whole length of the boiler, returned through these flues to the front of the boiler, where the flues united by one common connection with the chimney. The lower part of the chimney, for a few feet in extent, is formed by a vertical extension, in the cylindrical form, of both the inner and outer shell of the boiler. These internal and external cylinders are secured to each other by brace bolts as before described. In this portion of the boiler the steam is heated and rarified by the passage of the fire or heat through the inner cylinder or flue as it ascends the chimney. This part of the boiler is called the *steam chimney*, and here were attached the pipes which conduct the steam to the engine. These portions of the boilers have received no injury from the explosion, but were severally found attached to the flues of one boiler, and to the remains of the outer shell of the other. The cylindrical flues, which must have been the soonest exposed to the action of heat, in case of the deficiency of water, remain in the most perfect order, those of each boiler being still united to each other by their terminal connections, and no evidence of exposure to heat has been discovered. Those of the larboard boiler were thrown on end against the enclosure of the water wheel, and those of the starboard boiler have been since found in a position which shows that they had been thrown sternwise over the boat, and had fallen into the river at some distance from her larboard quarter. The shell of the same boiler was separated from the flues, and thrown outwards into the river; and that of the larboard boiler was also separated from the flues and thrown towards the shore, and was found resting upon the margin of the wharf, the boat being perhaps thirty yards distant from the wharf at the time of the explosion. Both the external shell, and internal arches of the boilers, have entirely lost their original form, and, to a considerable extent, this form is inverted or turned inside out. The whole was found to be dismembered and torn in a manner which it is difficult to describe. The boilers were not, as occurs in some cases of steam boat explosions, rent merely in the main flue, thus giving vent to the steam, or, as in other cases, with a head torn off and lacerated, and still retaining their external form, and remaining in their beds; but the boilers of the New England were torn asunder, and folded in massy doublings, like a garment; and they were so crushed, flattened, and distorted, that, as they lay upon the wharf after they were raised from the bed of the river, it was difficult for a common observer to discover how the mutilated parts were ever connected into symmetry, so as to combine just proportion and strength.

The appearance of the boilers, however, was such as to indicate that they had been constructed in a substantial manner. The cop-

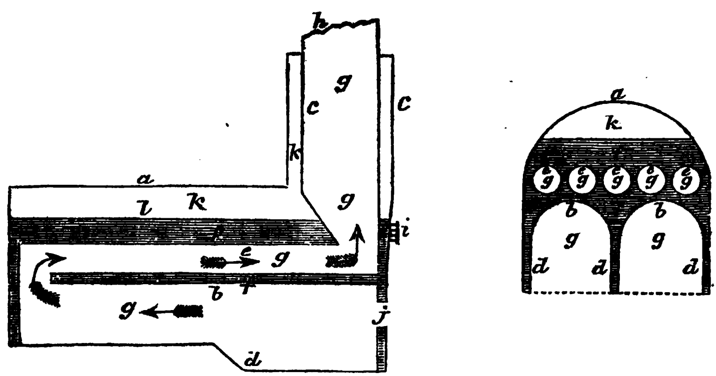
per, in all the ruptured parts, had every apearance of being tough and free from flaws; nor did it exhibit the flaking, and discoloration, which great heat is known to produce upon the metal when not covered by water. The metal varied in thickness in the different parts, the legs being made of No. 3, the shell of No. 4, and the return flues of No. 5; the strength being in each case adapted to the situation or degree of exposure; and much additional strength was further secured to all parts of the boilers by a frequent and liberal use of bolts and braces. The after ends of the two boilers still remain in the river,* all attempts to discover them having as yet proved ineffectual.

The appearance of the several parts on a careful examination seemed to indicate that the disruption had *commenced* in the arches of the main, or furnace, flues, at some point near to their posterior termination, where they unite with the upper flues and after end of the boiler. On this point, however, nothing of a very positive character can be ascertained, although the entire separation and loss of the ends of both the boilers, strengthens the supposition as does also the fact that the flues of the larboard boiler, which first exploded, were thrown forward against the water wheel. Some slight imperfection and leakage in this portion of both boilers had been discovered, and was repaired at Hartford at the termination of the previous trip.

Having finished our survey of the wreck, we then proceeded to the examination of *witnesses*, who were duly sworn by an attending magistrate. And here we may remark, that the general aspect of the testimony and the manner of the several witnesses, bore every mark of the simplicity of truth; and we cannot doubt that on all the essential points, we have obtained the honest declaration of all the circumstances that came within their knowledge and observation.

Boilers of the New England.

Longitudinal Section. **Cross Section.**



* Since the examination, both of them have been found in the river; they were blown far astern of the steam boat.

a The outer shell of the boiler. *b b* The arches or tops of the main or furnace flues—*c c* The steam chimney.—*d d d* The water legs.—*e e e e e* The upper or return flues.—*f f f* The water in the boilers.—*g g g g g* The passage for the fire through the flues to the chimney.—*h* The iron chimney pipe cut off above its junction with the steam chimney.—*j* The furnace door.—*i* The water cocks.

Testimony of Alexander Marshall, *Engineer.*

Was engineer of the Steam Boat New England, on the 8th of October last. Left New York a few minutes after 4 P. M. on that day, with a light pressure of steam. The engine having been started cold, the steam did not increase till we had proceeded as far as Hurlgate.

The average pressure used on the passage was from 10 to 12 inches. The steam rose after starting from 8 to 14 or 16 inches. At 7 P. M. left the engine in charge of Mr. Younger, the assistant engineer, and retired to rest with a view of taking his watch at 10 P. M. Was called by Mr. Younger at 10 o'clock. There was a heavy sea in the Sound, and, in consequence of orders from Capt. Waterman, the steam was reduced to 8 or 9 inches. Was obliged to stop before arriving in the river, by order of the pilot, in order to adjust the wheel rope. Arrived in the river about one o'clock A. M. Missed the wharf at Saybrook, and after a second attempt to gain the wharf, some difficulty occurred with the lifting valves, in consequence of the binders by which they are confined being screwed too tight, which made it necessary to anchor. After loosening the valve rods, the boat got under way, and landed at Saybrook. Landed also at Lythe. Just before landing at Essex, went into the fire room and examined the gauge cocks (water cocks,) and found the water good in the boilers. This was three or four minutes previous to the explosion. The boat was stopped about two minutes at Essex to land a passenger, with the small boat. Took hold of the pulley of the safety valve for the purpose of raising it, and at this moment the explosion took place. Does not know whether he had lifted the valve or not.

Being further examined, he says, that the steam gauge did not exceed 14 inches while in the Sound, nor 10 inches after entering the river. This statement is not founded on actual measurement. There was no scale of inches marked to either of the steam gauges. Refers only to the height of his own gauge in the engine room. Is aware that the steam gauges in the two fire rooms ranged considerably higher. Ascribes the difference to the greater expansion of the mercury in the fire rooms from their proximity to the fire. Had a greater pressure of steam immediately previous to the explosion than was proper to use in the river, where the boat does not steer well under a strong power, and this was the reason why witness attempted to raise the safety valve.

Witness further says, that the New England commenced her first trip on the 10th of August last under the charge of witness as engineer, he having been employed to set up the engine. The charge of the engine was afterwards given to Mr. Potter, the engineer of the company who owned the boat.

Witness again took charge of the engine on the trip previous to that on which the accident occurred, in consequence of the illness of Mr. Potter. Witness was employed as engineer of a steam boat at the South twelve years ago, which boat was run by him during the season of navigation. Says that his management on the night of the accident was not at any time influenced by a desire to shorten the passage. Heard no inquiry made by any of the passengers about racing. The only fuel used in the New England was pine wood. Witness has been twenty years engaged in his present business. Has served a regular apprenticeship in the manufacture of engines. Has been employed in New York by Mr. M'Queen, Mr. Allaire, Mr. Sabbatton, and the West Point Foundry Association.

The safety valve of the New England was loaded 18 pounds to the square inch, and its position on the steam pipe is 20 feet, or more from the boilers. Besides two regular weights, on the safety valve, there were two extra weights, a 50 lb. and a 28 lb. The valve will blow off at 8 pounds to the square inch, with the two regular weights. This is owing to the lever of the safety valve having been shortened about 2 feet to bring it within the walls of the room by which it is enclosed. The diameter of the safety valve is 10½ inches. The diameter of the steam pipes which lead from the boiler is about 10 inches.

Testimony of ROBERT YOUNGER, *Assistant Engineer.*

Witness started from New York at a few minutes past 4 o'clock P. M. as assistant to Marshall. At 7 P. M. Marshall left the engine in charge of witness. About half past 8, Capt. Waterman came to the engine room and asked if the engine did not labor too much in the sea? Also inquired the height of the steam gauge; was answered 10 inches. Capt. Waterman requested him not to carry any more. Witness then blew off steam and went to the fire room and gave directions for less fire. Run with steam from 8 to 10 inches till Mr. Marshall came on deck at 10 o'clock. Witness examined the water in the boilers frequently on the passage. Did not see the height of the steam gauge for the last 10 or 15 minutes previous to the explosion, because his view of the gauge while standing at his post in the engine room, was obstructed by an appendage to the steam pipe. There was no difficulty occurred in the management of the water in the boilers. One of the boilers foamed once while Mr. Marshall was below. This was immediately stopped by putting oil into the force pump. The steam was blown off at Saybrook while lying to for the purpose of loosening the binders of the lifting rods. This was before landing at Saybrook

Point. The position of the bulk head did not prevent the raising of the safety valve. Witness saw the movable part of the bulk head in its proper place on the morning after the accident. Is certain of this fact from his own personal examination. Has never witnessed an accident of this kind before. Has been twelve years engaged in the business of making engines. Made his first trip as an acting engineer in the New England when the boat was first started. Assisted Marshall in fitting up the engine. Thinks that there was no want of water above the flues, but is of opinion that the steam had blown the water from the legs of the boilers.

Testimony of WILLIAM VAIL, *Pilot.*

Says that the New England left New York, at 12 minutes past 4, P. M. in company with the steamboat General Jackson. The steamboat Boston left the wharf soon after the New England. The Boston gained upon the New England till they reached Hurlgate. The New England then got steam on, and drew away from the Boston. Found a heavy sea in the Sound, after passing Sand's Point, and the Boston then preserved her distance. The New England steers very badly. After passing Falkner's Island, the wheel rope got foul, and detained us a few minutes, and the boat fell into the trough of the sea. Off Killingworth, and again off Duck Island, the same detention occurred. When off Cornfield Point, (Saybrook,) witness told the Engineer, that the boat would not steer in the dark with such a heavy sea, and told him not to carry over 7 inches, and repeated the same direction to the Engineer, when in the river. When crossing the bar at the mouth of Connecticut river, the boat steered very badly, and was obliged to ring the bell to shut off the steam. Missed the dock twice at Saybrook, in consequence of no person being on the dock to take a line. Backed down to near the Fort, where owing to some difficulty with the valves, the boat could not be started ahead, and was obliged to anchor to prevent drifting on shore. Went again to the engine room, and waited twenty minutes for the engineer to get ready for a start. Looked into the fire rooms and asked if the water was plenty in the boilers, and was answered "yes." Got up the anchor and landed at Saybrook. Started again from Saybrook, and was obliged again to order the steam shut off, because it was difficult to steer the boat. Landed at Lyme, and on starting again found that the boat jumped so with a head of steam, and steered so hard, that it was necessary to shut off the steam again, and continued shut off till we reached Essex, seven miles from Saybrook. Was detained three or four minutes in landing at Essex. When the small boat had landed, Capt. Waterman, gave the word, and witness rung the bell to start the engine, and the explosion immediately followed.

The steam was not blown off at Essex. Witness thought at the time, there was too much steam on. Heard but one explosion, which was like a heavy fall or crash. Had been pilot of the N. E. for 30 days, which was nearly as long as the boat had run. The

accident occurred an instant after ringing the bell to go ahead. Witness had felt apprehensions for his personal safety, on account of the pressure of steam which was carried. Judged of this by the motion of the engine and the management of the boat. Saw at Saybrook, the steam gauge standing at 12 or 14 inches, and cautioned the firemen against carrying too much steam. The stop at Essex was not longer than 3 or 4 minutes.

The greatest distance gained of the Boston, was about two miles and a half, which was near the head of the Sound. The Boston was nearly abreast when we entered the river. Witness is unable to make up his mind as to the cause of the accident, but thinks that the rent commenced in the legs of the boiler near the after end.

Testimony of Giles Farnham, *Fireman.*

This witness was on duty at the larboard boiler. Took the first watch from New York, and went below at 8 o'clock. Took his second watch after 12 o'clock, just before boat entered the river. There was but 8 or 10 inches steam on the boiler before the boat arrived at Saybrook. The steam gauge rose to 12 or 13 inches while lying at anchor at that place. Blew off the steam to 7 inches and pumped water by hand into the larboard boiler. Witness says the water was lower in the boiler at this time than at any other, being at the 2d cock. The other boiler needed no supply. Witness examined the water every five minutes. Started from Saybrook with water at 3 cocks, and kept it afterwards at 4 cocks till the time of the accident. Above Lyme, there was more steam on than there ought to be for the river. The floating stick of the steam gauge in the larboard furnace was within two inches of the upper or boiler deck when the boat stopped at Essex, and witness supposes it must have reached the deck previous to the accident.

While the boat was stopped at Essex, tried the water cocks and found the water as high as the upper cock. The witness then went over to the starboard fire room and told Bell, the other fireman on duty, that "he would not have to fire up again for a week if they went on so." Had but a moderate fire at this time in the furnace. Says, the extra pressure was owing to the engine being shut off so much. At the moment of the explosion witness was sitting on the rail of the fire room gangway, at the outside of the guard, conversing with Bell, the other fireman. Witness heard a sudden cracking of the boiler, and attempted to look round to see what was the matter, which is the last he knew till he found himself in the water. Was severely scalded, but succeeded in swimming to the shore. Witness says that when there was no steam on the boiler, the top of his gauge rod was so short as to fall three inches below the top or muzzle of the steam gauge, and therefore did not indicate so much pressure as the gauge of the other boiler, that is, did not indicate the whole amount of pressure by three inches.

Testimony of Edwin Bell, *Fireman.*

Was in charge of the starboard boiler at the time of the accident. Left New York with seven inches steam, and carried about the same pressure till through Hurlgate, after which carried 12 or 13 inches till dark.

Was then directed by Mr. Younger, to keep 8 or 9 inches, which was done till 8 o'clock, when witness took his watch below. Came on duty, and took the fire again at Saybrook, at which time there was 8 or 9 inches of steam on, and the fire was run down. Capt. Waterman, came and asked witness about the water, examined and found three full cocks. Witness had no occasion to supply his boiler by the hand pump. At Lyme, the steam gauge was at 12 or 13 inches, and on reaching Essex, the gauge rod was within 3 or 4 inches of the upper deck.

When the boat stopped it soon rose to the deck. Witness then turned off the condensed water from the steam gauge, which caused it to fall about 2 inches, but it soon rose as high as before. Tried the water cocks and found good solid water at three lower cocks, and steam and water at the upper cock. Went over to the larboard boiler when we first stopped at Essex, and found 3 cocks of good water and the gauge rod 3 or 4 inches from the deck. The gauge rod of the starboard boiler usually stood higher than the one in the larboard fire room.

Witness never saw the float rods of the steam gauges so high as at this time. Has run in the boat from her first trip. Witness told Giles (Farnham,) when the latter came into his room, "that they would not have to fire up more than once more during the whole watch."

There was a light fire kept up between Lyme and Essex. Witness heard no steam blown off at Essex. The accident happened about 3 o'clock in the morning. The New England came out from New York before the Boston. At 8 o'clock, the Boston was about 2 miles astern.

Testimony of Isaac Seymour, *Mate.*

Agrees in the statements made by Mr. Vail. In the Sound from Sand's Point to Matinecock Point, the steam stood at the pressure about 8 inches, and Mr. Marshall was sometime blowing off. Marshall said that it was made faster than he wanted it, and that he should speak to the fireman. Thinks there was 10 or 12 inches on the gauge in the engine room, at the time when the boat was anchored at Saybrook and they commenced blowing off. Saw the water tried in the boilers at Saybrook, which showed plenty. The larboard boiler was then pumped into by hand.

Perceived no difficulty in working the boat except at Saybrook. Was not apprehensive of any accident. Was employed in landing with the small boat at Essex. Saw Mr. Marshall visit the fire room just before the landing at Essex. Witness was facing the dock when he first heard a cracking noise, and was in the act

of turning towards the steam boat when the explosion instantly followed.

The larboard boiler, which was nearest to witness, exploded a little before the other. Could just perceive the difference.

Testimony of Roswell Potter, *Engineer.*

Witness has run the New England as engineer since she first commenced running except the first and last trip, when he stayed back on account of ill health. Had no reason to expect that any thing would go wrong. Usually carries from 14 to 17 inches of steam on the boilers of the New England. The engine is intended for carrying 16 to 18 inches. Safety valve, as loaded at the time of the accident, would begin to blow off at 18 inches. Had three steam gauges, which would rise from 31 to 32 inches without blowing out the mercury. Steam gauges of this length are now used in the steam boats. The gauges in the fire rooms would stand 3½ inches higher than the engineer's gauge in the engine room; supposes this to be owing to the loss of heat from the steam in passing through the steam pipe. Has run with Capt. Bunker to New Haven, with steam at 8 inches. This was several years ago. Boilers are now made stronger than those which were formerly used.

The extreme of safe pressure on the boilers of the New England, he thinks to be 22 to 24 inches. The boat would not sail faster with this pressure than with 17 inches. Has had 24 inches on the boilers; once, when the boat was on trial, and at other times since. This was occasioned by stopping the engine. Has not seen the gauge rods rise as high as the boiler deck in any case. Witness examined the steam gauge in the engine room after the accident, and found it in perfect order with the mercury remaining in the gauge. Also found mercury in one of the fire room gauges, both of which were torn down by the explosion. The height of the gauge rod when up to the deck in the fire room would be 28 inches. After turning off the condensed water from above the mercury, we get the true gauge. Has not known any racing with the New England, except with the steam boat Providence, on which occasion had bad wood, and could get a pressure of but 11½ inches. The engineer must stand constantly at the engine, to attend to the orders of the pilot. Was engineer of the steamboat Oliver Ellsworth for several years, and usually carried from 12 to 14 inches of steam on the boiler of that boat. The Oliver Ellsworth has the strongest boiler. The latter is made of stouter copper than those of the New England, is 9½ feet in diameter by 16½ feet in length, and is stronger braced than any boiler the witness has ever seen. The engine of the New England is nearly four times the power of that of the Oliver Ellsworth. Thinks that the middle legs of the boilers were heated, and that they now appear to be annealed, and different from the outside of the boiler. The force pumps of the New England are very large, and will fill the boilers running over full from Saybrook to Essex. The New England will steer well with

8 or 10 inches steam in smooth water. The Oliver Ellsworth formerly carried from 12 to 14 inches, and now carries 16 to 18 inches. The McDonough carries 12 to 14 inches. On being further examined, witness says that one of the boilers of the New England was patched twice on the middle leg at the after end, and that a similar patch was put upon the same part of the other boiler. There was a crack in the flange at this point, which made a leak, but these repairs did not stop it. This was the trip previous to the accident. The safety valve would commence blowing off at 18 inches, but had carried 24 inches with the same weights, with the steam blowing through the valve. The boilers had not been proved above 24 inches. Had found the brace bolts between the top of the furnace and the connection of the flues to the steam chimney, to be leaky, owing to a straitening in the angle of the braces. Had taken them out, and put strait screw bolts in their stead. This was on the second trip which the boat made. Considers the engine to be of 120 horse power.

[TO BE CONTINUED.]

Notice of a means of preparing the organs of respiration, so as considerably to extend the time of holding the breath; with remarks on its application, in cases in which it is required to enter an irrespirable atmosphere, and on the precautions necessary to be observed in such cases. By MICHAEL FARADAY, *Esq. D.C.L. F.R.S., &c. Fullerian Professor of Chemistry in the Royal Institution.*

There are many facts which present themselves to observant men, and which, though seen by them to be curious, interesting, and new to the world, are not considered worthy of distinct publication. I have often felt this conclusion to be objectionable, and am convinced that it is better to publish such facts, and even known facts under new forms, provided it be done briefly, clearly, and with no more pretention than the phenomena fairly deserve. It is this feeling which makes me send, for your acceptance or rejection, an account of an effect, new to me, and to all to whom I have mentioned it, and which seems to have some valuable applications.

At one of the scientific meetings at the apartments of his Royal Highness the President of the Royal Society, whilst speaking of certain men, who by means of peculiar apparatus for breathing, could walk about at the bottom of waters, and also of the pearl fishers; Sir Graves C. Haughton described to me an observation he had made, by the application of which a man could hold his breath about twice as long as under ordinary circumstances. It is as follows:—If a person inspire deeply, he will be able immediately after to hold breath for a time, varying with his health, and also very much with the state of exertion or repose in which he may be at the instant. A man, during an active walk, may not be able to cease from breathing for

more than half a minute, who, after a period of rest on a chair or in bed, may refrain for a minute, or a minute and a half, or even two minutes. But if that person will prepare himself by breathing in a manner deep, hard, and quick, (as he would naturally do after running,) and ceasing that operation with his lungs full of air, then hold his breath as long as he is able, he will find that the time during which he can remain without breathing, will be double, or even more than double, the former, other circumstances being the same. I hope that I have here stated Sir Graves C. Haughton's communication to me correctly; at all events, whilst confirming his observation by personal experience, I found the results to be as above.

Whilst thus preparing myself, I always find that certain feelings come on me, resembling, in a slight degree, those produced by breathing a small dose of nitrous oxide; slight dizziness and confusion in the head are at least produced; but on ceasing to breathe, the feeling gradually goes off, no inconvenience results from it either at the time or afterwards, and I can hold my breath comfortably for a minute and a quarter, or a minute and a half, walking briskly about in the mean time.

Now this effect may be rendered exceedingly valuable. There are many occasions on which a person who can hold breath for a minute or two minutes, might save the life of another. If, in a brewer's fermenting vat, or an opened cesspool, one man sinks senseless and helpless, from breathing the unsuspected noxious atmosphere within, another man of cool mind, would, by means of this mode of preparation, which requires nothing but what is always at hand, have abundant time, in most cases, to descend by the ladder or the bucket, and rescue the sufferer without any risk on his own part. If a chamber were on fire, the difference in the help which could be given to any one within it by a person thus prepared, and another who goes in perhaps with lungs partially exhausted, and who, if he inhale any portion of the empyreumatic vapours of the atmosphere, is stimulated to inspire more rapidly, and is therefore urged to instant retreat into fresh air, is so great, that no one who has noticed what can be done in a minute or two minutes of time, can doubt the value of the preparation under such circumstances, even though from want of practice, and from hurry and alarm, it may be very imperfectly made. In cases of drowning, also, a diver may find his powers of giving aid wonderfully increased, by taking advantage of Sir Graves Haughton's fact.

I have myself had occasion to go more than once or twice into places with atmospheres rendered bad by carbonic acid, sulphuretted hydrogen, or combustion; and I feel how much I should have valued at such times the knowledge of the fact above stated. Hoping, therefore, that it may be useful, I will add one or two precautions to be borne in mind by those who desire to apply it.

Avoid all unnecessary action, for activity exhausts the air in the lungs of its vital principle more quickly, and charges it with bad matter. Go collectedly, coolly, and quietly to the spot where help is

required: do no more than is needful, leaving what can be done by those who are in a safe atmosphere (as the hauling up of a senseless body, for example,) for them to do.

Take the precautions usual in cases of danger, in *addition* to the one now recommended. Thus, in a case of choke-damp, as in a brewer's vat, hold the head as high as may be; in a case of fire in a room keep it as low down as possible.

If a rope be at hand by all means let it be fastened to the person who is *giving* help, that he may be succoured if he should venture too far. It is astonishing how many deaths happen in succession in cesspools and similar cases for want of this precaution.

It is hardly needful to say, do not try to breathe the air of the place where help is required. Yet many persons fall in consequence of forgetting this precaution. If the temptation to breathe be at all given way to, the *necessity* increases, and the helper himself is greatly endangered. Resist the tendency, and retreat in time.

Be careful to commence giving aid with the lungs *full* of air, not *empty*. It may seem folly to urge this precaution, but I have found so many persons, who, on trying the experiment on which the whole is based, have concluded the preparation by closing the mouth and nostrils *after an expiration*, that I am sure the precaution requires to be borne in mind.

I have thought it quite needless to refer to the manner in which the preparation enables a person to increase so considerably the time during which he may suspend the operation of breathing. It consists, of course, chiefly in laying up for the time, in the cells of the lungs, a store of that vital principle which is so essential to life. Those who are not aware of the state of the air in the lungs during ordinary respiration, and its great difference from that of the atmosphere, may obtain a clearer notion from the following experiment:—Fill a pint or quart jar with water, over the pneumatic trough, and with a piece of tube and a forced expiration, throw the air from the lungs in their *ordinary state* into the jar: it will be found, that a lighted taper put into that air will be immediately extinguished.

A very curious fact connected with the time of holding the breath was observed by Mr. Brunel, jr., and has, I think, never been published. After the river had broken into the tunnel at Rotherhithe, Mr. Brunel descended with a companion (Mr. Gravatt, I think,) in a diving bell, to examine the place: at the depth of about thirty feet of water, the bell touched the bottom of the river, and was over the hole, covering it, but too large to pass into it. Mr. Brunel, after attaching a rope to himself, inspired deeply, and sunk, or was lowered through the water, in the hole, that he might feel the frames with his feet, and gain further knowledge, if possible, of the nature of the leak. He remained so long beneath without giving any signal, that his companion, alarmed, drew him up before he desired; and then it was found, that either of them could remain about twice as long under water, going into it from the diving bell at that depth, as they could under ordinary circumstances.

This was supposed to be accounted for, at the time, by the circumstance, that at the depth of thirty feet, the atmosphere was of double pressure, and that the lungs, therefore, held twice as much air as they could do under ordinary circumstances. It is, however, quite evident that another advantageous circumstance must have occurred, and that the air in the lungs was also better in quality than it would have been at the surface of the river, as well as denser; for supposing the deterioration by breathing to continue the same for the same time, it is clear, that every inspiration passed into the lungs twice as much pure air as would have entered under common circumstances: the injured air must, therefore, have been removed more rapidly, and the quality of that at any one time in the lungs must have risen in consequence. When to this is added the effect of double quantity, it fully accounts for the increased time of holding the breath; and had the effect of the mode of preparation now described been also added, it is probable that the time would have appeared astonishingly increased. [*Phil. Mag.*

¶ POPULAR SCIENCE.

No. VI.

On the Instincts of Birds. By JOHN BLACKWALL, *Esq. F.L.S.*

[Continued from p. 360.]

After the business of nidification is completed, parturition commences, which is succeeded by incubation, and as the birds will frequently continue to deposit their eggs in the same nest, though all except one or two should be removed as fast as they are laid, or exchanged for others of a different size and colour; and as they will sometimes, after having produced their appointed number, sit upon a single egg, or the eggs of other birds introduced for the purpose of experiment, on artificial ones of chalk, or even upon stones of any irregular figure; it is plain that the act of depositing and incubating their eggs can be ascribed to instinct only.

The parental offices of birds to their young, are also regulated by instinctive feeling, as is evinced by their bestowing the same attention on the offspring of other species, when committed to their care, as they do upon their own. Thus the titlark and hedge-warbler manifest the warmest attachment to the young cuckoos, their foster nurslings, though they suffer their own progeny, ejected by the intruders, to perish from neglect within a short distance of the nest; and this affection continues with little diminution, till their suppositious offspring have nearly attained their full growth. Yet under other circumstances they would pursue and prosecute them with the utmost rancour.

The instinctive nature of these actions is likewise satisfactorily established by the fact, that birds when taken very young and brought

up in confinement, not only construct nests occasionally, but also lay their eggs in them, which they will sit upon till hatched, should they prove prolific, and will then carefully attend to the young. An anecdote or two serving more fully to corroborate the opinion advanced above, will not, it is hoped, be unacceptable.

In the beginning of May, 1812, having found a Buzzard's nest, containing a single egg, the egg was taken, and a light coloured stone substituted for it, over which a rat trap was set. The buzzard sat upon the trap for a day and a night, when it was discovered that the iron ring which confined the spring had not been withdrawn. The ring was then removed, and on visiting the nest afterwards, the female was found caught by the feet. This change of character in so watchful and quicksighted a bird as the buzzard, is certainly very surprising, and must baffle every attempt to connect it with any intellectual process.

A highly interesting anecdote, illustrative of the attachment of the raven to its eggs, is thus admirably related by Mr. White:* "In the centre of a grove there stood an oak, which, though shapely and tall on the whole, bulged out into a large excrescence about the middle of the stem. On this a pair of ravens had fixed their residence for such a series of years, that the oak was distinguished by the title of the raven-tree. Many were the attempts of the neighbouring youths to get at this eiry; the difficulty whetted their inclinations, and each was ambitious of surmounting the arduous task. But when they arrived at the swelling, it jutted out so in their way, and was so far beyond their grasp, that the most daring lads were awed, and acknowledged the undertaking to be too hazardous. So the ravens built on, nest upon nest, in perfect security, till the fatal day arrived in which the wood was to be levelled. It was in the month of February, when those birds usually sit. The saw was applied to the butt—the wedges were inserted into the opening—the woods echoed to the heavy blows of the beetle or mallet—the tree nodded to its fall—but still the dam set on. At last, when it gave way, the bird was flung from her nest, and though her parental affection deserved a better fate, was whipped down by the twigs, which brought her, dead, to the ground."

That ardent affection which most birds feel for their young, seems to awaken their dormant energies, and to inspire them with a degree of courage and address that is called forth on no other occasion. Nor is the violence of this affection, to use the language of Mr. White, more wonderful than the shortness of its duration. Thus, every hen is, in her turn, the virago of the yard, in proportion to the helplessness of her brood, and will fly in the face of a dog or a sow, in defence of those chickens which, in a few weeks, she will drive before her in relentless cruelty. The partridge will tumble along before a sportsman, in order to draw away the dogs from her helpless covey; and a very exact observer (the Rev. John White,) has remarked, that

* Natural History of Selborne, p. 6.

a pair of ravens nestling in the Rock of Gibralter, would suffer no vulture or eagle to rest near their station, but would drive them from the hill with amazing fury; and that even the blue thrush, at the season of breeding, would dart out from the clefts of the rocks to chase away the kestril or the sparrow hawk. Indeed, so regardless of danger are some species while their nestlings are small, that I have known the redbreast, winchat, great titmouse, &c. when introduced to their nests, after having been forcibly removed to a distance from their unfledged young, remain quietly upon them as if they had not been molested. Yet, although this instinct, the transient effects of which depend, most likely, on a temporary excitation of the parental feelings by some physical modification of the corporeal organs, thus for a time powerfully predominates, its manifestations are nevertheless frequently influenced by the active co-operation of the intellectual faculties, as in the following examples:

"The fly catcher," says Mr. White,* "builds every year in the vines that grow on the walls of my house. A pair of these little birds had one year inadvertently placed their nest on a naked bough, perhaps in a shady time, not being aware of the inconvenience that followed. But a hot, sunny season coming on before the brood was half-fledged, the reflection of the wall became insupportable, and must inevitably have destroyed the tender young, had not affection suggested an expedient, and prompted the parent bird to hover over the nest all the hotter hours, while, with wings expanded, and mouths gasping for breath, they screened off the heat from their suffering offspring."

"A further instance," continues the same author,† "I once saw of notable sagacity in a willow-wren, which had built in a bank in my fields. This bird, a friend and myself had observed as she sat on her nest; but was particularly careful not to disturb her, though we saw she eyed us with some degree of jealousy. Some days after, as we passed that way, we were desirous of remarking how this brood went on; but no nest could be found, till I happened to take up a large bundle of long green moss, as it were carelessly thrown over the nest, in order to dodge the eye of any impertinent intruder."

Actuated by a similar motive, old birds, which have their young much handled, use every art to induce them to desert the nest as early as possible; and I have known the redbreast, on such occasions, take off her nestlings long before they could make the slightest use of their wings. That this mode of proceeding must be referred to intelligence, cannot, I think, be doubted, as the danger of allowing their progeny to remain in a state of insecurity is evidently perceived, and the surest means of avoiding it, deliberately adopted in consequence.

Many birds, under particular circumstances, manifest a natural inclination to fight. This disposition is remarkably conspicuous in the ruff, the quail, and the domestic cock. That the feeling is innate,

* Natural History of Selborne, p. 151. † Ibid, p. 151

and dependent upon organization, is clearly proved by the established fact, that careful breeding and training exercise a powerful influence upon the last species with regard to this propensity.

Dr. Darwin states that pheasants and partridges teach their young to select and take up their food; and hence he seems disposed to infer that all birds receive instruction in these particulars; but that they are impelled, by instinct, independently of education and experience, to exercise the functions of their various corporeal organs, whose structure is admirably adapted to the several offices they have to perform, admits of such numerous and decisive proofs, that it is truly amazing how a person of so much observation as Darwin could so entirely overlook them.

Those young birds which do not acquire the use of their eyes for several days after they are hatched, open their mouths for food as soon as they are stimulated by hunger, not only when the old ones bring it to them, but when any thing approaches the nest. Nestlings, too, as soon as they are grown sufficiently large, mute over the edge of the nest, though the parent birds carefully convey to a distance whatever drops from them that they do not succeed in ejecting. These actions occur also when the birds are brought up in confinement, however young they may be when taken, and therefore must be instinctive.

The common duck has its toes connected by a strong membrane, which enables it to swim with facility; and the young of this species, though hatched under birds which instinctively avoid committing themselves to the water, rush to it with avidity almost as soon as they are extricated from the shell, notwithstanding the utmost exertions of the foster mother to divert them from it.

Young swifts are rarely, if ever, observed to perch; and as they cannot easily be distinguished from old ones by their flight, they must display a considerable command of wing the very first time they quit the nest.

Many of the gallinaceous tribes scratch up the earth with their feet in search of food; and they will frequently repeat this action when fed on a stone or boarded floor, where it can answer no useful purpose. Now, as they do not correct this error, it is plain that the action itself does not originate in observation, experience, or reflection. Neither can it be attributed to education; nor is this particular misapplication of it to be ascribed to the force of habit, as it may often be observed in very young chickens, which have never associated with others of their kind. But, what is still more to the purpose, and indeed decisive of the general question, even pheasants and partridges, as well as ducks, chickens, turkeys, and guinea-fowls, which have been hatched by artificial heat, possess the instincts peculiar to their respective species, as I have had several opportunities of ascertaining. How young birds, by their struggles in the egg, can at all facilitate the use of their legs, as Dr. Darwin conjectures, is to me inconceivable, especially when the position in which they lie is taken into consideration. But even supposing this notion to be correct, it

does not in the least affect the instinctiveness of the act; unless we conclude with Darwin, that instinct has nothing to do with any of those actions which result from the repeated efforts of the muscles, under the conduct of the sensations or desires,—an opinion so manifestly erroneous, that it does not require a formal refutation.

[TO BE CONTINUED.]

Meteorological Observations for November, 1833.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	23°	52°	30.25	30.25	W.	Moderate.		Clear day.
	2	38	63	29.90	29.90	W.	do.		Lightly cloudy—hazy.
	3	39	49	.95	30.00	W.	do.		Hazy.
☽	4	28	35	30.10	.20	NE. W.	do.		Cloudy—flying clouds.
	5	23	39	.30	.33	W.	do.		Clear day.
	6	29	45	.20	.05	W.	Calm	0.04	Cloudy: shower of hail: rain.
	7	39	49	.00	.10	W.	do.		Flying clouds—cloudy.
	8	39	60	.05	.10	W.	do.		Hazy.
	9	60	61	29.70	29.70	S	do.		Cloudy—drizzle.
	10	42	52	.80	.80	W.	do.		Clear day.
⊗	11	37	53	.90	.85	W. SW.	do.		Clear—rain.
	12	57	54	.55	.55	SW.	Moderate.		Rain: flying cl'ds.: shower of
	13	34	49	.80	.80	W.	do.		Clear day. [meteors.
	14	32	50	.70	.66	S. W.	Brisk.		Hazy—clear.
	15	38	43	.35	.35	W.	do.		Cloudy day.
	16	25	37	.65	.65	W.	do.		Cloudy—flying clouds.
	17	28	36	.60	.60	W.	Moderate.		Cloudy—snow—cloudy.
	18	28	41	.80	.80	W.	do.		Clear day.
	19	26	33	30.05	30.05	W.	do.		Clear day.
☾	20	26	40	.20	.20	W. E.	do.		Clear day.
	21	23	48	.25	.20	S.	do.		Clear day.
	22	45	43	29.90	29.75	NW.	do.	0.45	Rain—cloudy.
	23	31	44	.75	.75	NW.	do.		Clear—hazy.
	24	35	45	.90	.95	W.	Calm.		Cloudy—hazy.
	25	38	38	.65	.50	E.	Brisk.	1.15	Rain.
	26	32	34	.50	.75	W.	Blustering		Cloudy—flying clouds.
	27	27	33	.90	.90	W.	Moderate.		Clear day.
☺	28	33	41	.95	30.00	W.	do.		Clear day.
	29	25	44	30.10	.00	SE. S.	do.		Clear—cloudy.
	30	40	42	29.90	29.80	SE. SW.	do.	0.16	Drizzle—rain.
	Mean	34.00	45.07	29.89	29.88			1.80	

	Thermometer.	Barometer.
Maximum height during the month,	63. on 2nd.	30.33 on 5th.
Minimum do. . . .	23. on 1st. 5th. & 21st.	29.35 on 15th.
Mean do. . . .	39.53	29.88

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

FEBRUARY, 1834.

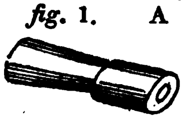
Remarks on the use of Anthracite Coal in Smith's Work. *By* Alfred C. Jones.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—I have had occasion to observe the facility with which anthracite coal is used for working iron, by the smiths in this part of the country, and as I wish to see it brought into operation in other places, on account of the decided saving resulting from its use, I have supposed it important to give accurate information as to the best method of adapting the forge to its use, and of making the fire. The methods employed successfully in its use by the best workmen are as follows:—

The arrangements of the forge, with the exception of the parts which I shall describe, are the same as where bituminous coal is used. The fireback of the forge for using anthracite, projects at the bottom, at least two inches from a vertical line, as shown by the accompanying diagram, fig. 2, and the bed for the coals is larger for anthracite than when bituminous coals are used. The tuyere iron is made in the form shown in fig. 1; the nozzle A is four inches in length, and three in diameter, and projects out at least three inches from the fireback; the orifice for a thirty inch bellows is one inch and one-eighth in diameter, the nozzle of the bellows extends into the tuyere iron, so that its end is even with the fire-

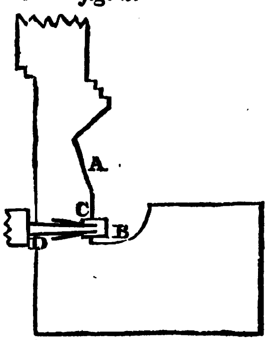
fig. 1.



back. In making the fire the common method is to rake out the half burned coal towards the front of the forge, and to separate the cinders from it; then to set fire to a few shavings in the bed, placing on these several blocks of soft pine; to urge the bellows gently until the wood is partly ignited, when the bellows is no longer to be worked: the wood is now covered with fresh coals, when the whole blast may be employed. The half burned coal that was raked out of the bed, may then be banked up against the fresh coal. The best method of keeping the fire uniform is to selecta large lump of coal, free from slate, and place it on the front of the forge hearth, and whilst the iron is heating in the fire, to break off small portions, which should never be larger in size than walnuts. It is of considerable importance to use the coal small, as a heat is obtained much quicker by so doing; when the coal is large, a great part of the blast passes through the interstices, and a portion of the labour of the bellows blower is wasted. The body of the fire except on the side next to the anvil, is banked over with the half burned coal, which confines the flame to the top. For common purposes the fire need not be cleaned oftener than three times per day, say at ten A. M., at noon, and at four P. M., when the cinders having been taken out, a few blocks of wood are thrown on, the hot coals raked over them, and the bellows urged until the fire is in a fit state for going on with the work.

In using the poker for the purpose of giving the fire vent, its end should not be put below the tuyere iron, and its motion should be towards the front of the forge, and gently upwards. The tuyere iron may be protected from the intense heat of the fire by occasionally throwing a little of the refuse coal against the fireback, which otherwise would melt down or coat the iron. In the accompanying figure, 2, A is the fireback; B the bed for the coal; C the tuyere iron; D the bellows pipe.

fig. 2.



Where charcoal can be obtained cheaply, it may be used instead of wood for making a fire, but wood answers the purpose quite as well.

Tamaqua, December 21, 1833.

Description of the Furnaces used at the United States Armory, at Springfield, Massachusetts, for Welding Gun Barrels, with Anthracite Coal as a fuel.

We give, in connexion with the foregoing article, the description of the means employed at the Springfield Armory for obtaining a substitute for a hollow fire, with anthracite as a fuel. The drawings of the furnace there used were furnished by a scientific officer of Artillery, Lieut. D. Tyler, who has been engaged for some years in

the inspection of arms manufactured for the United States. The success of this furnace in affording a welding heat, without danger of burning the material, is represented to be complete. Of the drawings received, we have selected a plan and two cross sections, as giving a sufficiently complete idea of the construction of the furnace.

COM. PUB.

Fig. 2.

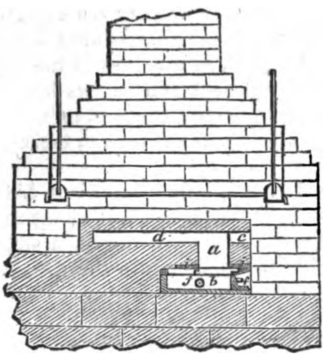
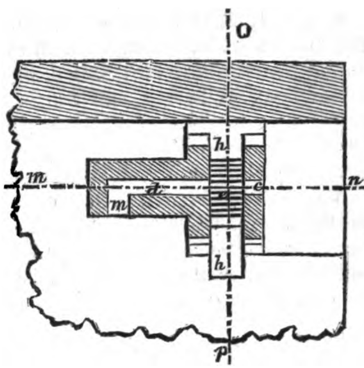
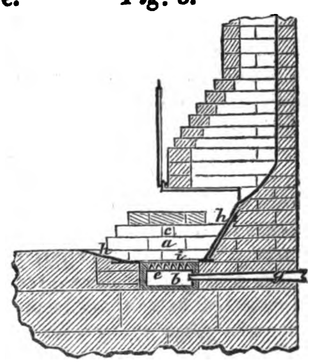


Fig. 1.



Description.—Fig. 2 is a plan, and figs. 1 and 3 are sections of the furnace. The section fig. 1, is on the line *m n* of the plan, and fig. 3 on *o p*, perpendicular to *m n;* the points through which the plane of section passes are shaded in the figure.

Fig. 3.



a, figs. 2 and 3, shows the interior of the furnace; its height being eight inches, its width seven, and the length of the covered part one foot six inches. This covered part is represented by the shaded portion in fig. 3, immediately over the grate.

b, figs. 2 and 3, is a cast iron box or chamber, the sides of which are about half an inch thick. The dimensions of the box are, length one foot six inches, width eleven inches, and depth four inches. The top of this chamber is open for about one foot two inches of its length to receive a fire grate *e*.

e, figs. 1, 2 and 3, represents the grate, covering the chamber just described, the length being fifteen inches, and the width eleven inches. It is composed of seven bars, each one inch in depth; and in width, on the upper surface, one inch, and on the lower surface half an inch.

f, fig. 2, is a movable door, by which to clean the chamber of the ashes and cinders which fall from the grate.

g, fig. 3, is the tuyere, or blast pipe, through which the supply of air to the fuel is introduced.

i, figs. 2 and 3, is a cast iron plate placed horizontally on the bottom of the furnace; a hole is cut through it for the passage of air from the chamber *b* to the fuel upon the grate.

h h, figs. 1 and 3, are two cast iron plates, half an inch in thickness, one of them being placed at each end of the furnace in the inclined positions shown in fig 3.

c, figs. 1, 2, and 3, is an opening two and a half inches high, and two inches wide, through which the gun barrel to be welded is introduced into the furnace; and *d*, figs. 1 and 2, is a recess of the same dimensions in height and width, and one foot ten inches long; its object is to receive the gun barrel, so as to permit the part to be heated to be brought directly over the fire. Into the recess *d*, there is a lateral opening *m*, fig. 1, five inches in width.

The furnace is built of fire bricks, the basis being a common blacksmith's forge. The two ends, as shown in fig. 3, are left open; upon one of them the fireman keeps a pile of coal, which forms a simple and efficient door; the coal is pushed with a poker into the fire, as it requires replenishing, and the pile is renewed.

Note on Astronomical Observations, particularly with reference to a Monthly Statement of Celestial Phenomena, to be Calculated for Philadelphia and its vicinity. By Sears C. Walker.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—It has frequently been remarked that while the natural sciences have been cultivated in this city with a zeal and success unexampled in this country, the science of practical astronomy has fallen into general neglect.

An excellent treatise on practical astronomy, by John Gummere, and several valuable papers in the Transactions of the American Philosophical Society, are nearly all that the press of Philadelphia has furnished in the last fifteen years. During this period many volumes and papers have been published on every subject of natural, medical, and chemical sciences, and practical mechanics.

Theoretical astronomy is taught in all our academies of note, and courses are given every year in all our public lecture rooms. These lectures are as well attended as those on any of the natural sciences. At this time, the course on this subject delivered at the room of the Franklin Institute by a gentleman distinguished for his attainments in astronomy, is listened to by a crowded audience.

We should not be astonished that a study so classical in its nature has numerous votaries; but we may be surprised that its practical applications should be neglected.

Yet within a few years the occultations of Venus, Jupiter, Saturn,

of Aldebaran, the transit of Mercury, and the solar eclipse of 1832, have passed away almost unnoticed, or which is nearly the same, the observations which have been made have been kept from the world.

I must here remark that the annular eclipse of 1831, was observed with a zeal whose rarity enhances its value.

It could not have been expected that a study which for fifty years took the lead of all others, should become so nearly obsolete; when in a neighbouring city it is still cultivated with untiring zeal. From the press of that city we are furnished with the means of interpolating between Boston, Mass., and Charleston, S. C., the times of interesting celestial phenomena visible in this place.

It has been supposed by some that the deficiency of apparatus has caused this neglect. I believe that this opinion is erroneous; for the means of making observations have been constantly increasing.

There are in the city, or in its immediate neighbourhood, four telescopes, as good as those used in the Royal Observatory of England for making observations of solar eclipses, lunar occultations, and eclipses of Jupiter's satellites. There are besides four achromatics of three and a half feet focal length, three Gregorians of equivalent magnifying power, and several thirty inch achromatics.

It is worthy of remark, that observations with the last class of thirty inch instruments, are eagerly collected and published in the Transactions of the Royal Astronomical Society of London. Chronometers and astronomical clocks are possessed in abundance by individuals; and there is in this city a manufactory of clocks and chronometers, of high reputation at home and abroad.

For rating these chronometers, a sextant would suffice in the hands of a careful observer; but there are four transit instruments either in perfect repair and adjusted to the meridian, or susceptible of repairs and adjustment by mechanical means, in the possession of individuals in this city.

It would seem that it is not the want of instruments which has retarded the progress of this study, for there are several individuals, in this city, better furnished with instruments than was Olbers when he made two discoveries of new planets, either of which will form an era in the history of his native country.

No one, I believe, will maintain that enough has already been done in practical astronomy here; or that additional observations would be useless. The longitude of this place is not completely determined, and were it so, the greater would be the need of accurate observations for correspondence with others made in every section of the country.

A century of observations at the London and Paris observatories, had not determined their difference of longitude with accuracy sufficient for the demands of science in England and France.

It will be a long time before accurate observations will be accumulated in this country to such a degree as to become superfluous. I may rather say, that such a period will never arrive.

It has been found by experience, that the circulation of predicted lunar occultations, and similar phenomena, in the European journals, has done much to promote the cultivation of this useful study.

With a hope that the possessors of astronomical instruments will be disposed to make observations, and publish them in the Journal of the Franklin Institute, or in some other journal, or transactions, I send you a list of the lunar occultations of the fixed stars to the seventh magnitude, inclusive, visible in Philadelphia, in the month of March; together with the eclipses of Jupiter's satellites, and other interesting celestial phenomena. These will be continued in future numbers,* if they meet your approbation, and accomplish the purpose for which they were intended.

I am, gentlemen,

Yours truly and very respectfully,

S. C. Walker.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Analysis and observations on divers Mineral Substances.

By Thomas G. Clemson.

[Read before the Geological Society of Pennsylvania.]

There exists, near Philadelphia, on the land of Dr. Parrish, considerable quantities of a substance which has the following properties. It is found in amorphous masses, of a dark brown colour, having an earthy fracture, may be cut with a knife, which gives a waxy or resinous lustre to the parts separated, a lustre which may be obtained more perfect by burnishing. It is susceptible of being reduced to an impalpable powder. The vestiges of vegetable fibre have not yet entirely disappeared from it, proving its vegetable origin. When exposed to heat, the ordinary products obtained from organic distillation, are given off.

Ten grammes of a portion previously dried to 100° centigrade, (212° Fah.,) were calcined in a close crucible, the loss in water and bituminous matter, was 3.4 grammes. The remaining 6.6 grammes, were then heated, and at the same time exposed to the air. The earthy residuum weighed 5.57 grammes. From this, the composition in parts of unity is as follows:—

Volatile matter,	0.340
Carbon	0.103
Cinders	0.557
	1.000

The cinders, or earthy matter, left after roasting were coloured of a reddish orange hue, owing to the presence of a little oxide of iron; it might thus be employed as a pigment. When in its natural state, and pulverized, it gives a fine brown colour, with all the intermediate shades between a dark and light brown, and may be used with glue

* The table for March, will be found by our readers at the close of this number. Com. Pub.

or with oil, either of them drying and covering well. After calcination in close vessels, it is perfectly black, and might be used as a black for ordinary purposes, being peculiarly well adapted, when properly mixed, to the coating of iron for preventing oxidation, to ship painting, or the various applications of black pigments used in dressing ships. The small portion of carbon, and the excess of earthy matter, will be obstacles to its being employed as a combustible; however, experiment may prove its utility for burning lime, bricks, and in those cases where slow evaporation is required. A use which might grow out of its property of taking a polish under pressure and friction combined, would be that of painting paper, as a varnish upon stained papers very much increases their value. This matter might be employed to colour, and, being susceptible of a lustre, would not require a varnish. The polish upon the French playing cards is obtained by rubbing the card with a little Marseilles soap, and then burnishing.

If employed alone, as a manure, it would not be attended with ameliorating effects, owing to its inalterability, but in a compost mixed with dung or lime, in the proportion of about one part of either of these substances to four or five of this matter, a fermentation would most probably ensue.

Another specimen of a perfectly similar substance was handed me for examination by Capt. Wm. Pell, and is found on his farm near New York, possessing all the properties of the preceding, save that the vegetable fibre in this case has entirely disappeared; like the former, it gives off the characteristic odour of peat when burning. It contains—

Volatile matter . .	0.201
Carbon	0.030
Cinders , . . .	0.769
	1.000

The ashes were of a dirty gray colour; the preceding observations are probably applicable to this second substance.

Assay of an Iron Ore from Franklin county, New York, found upon the land of Mr. H. B. Pierpoint.

This mineral has a crystalline texture; its colour when in mass is black, and when reduced to powder, greenish brown. It has a slight action upon the needle, without possessing evident marks of polarity; has a soft and somewhat of a resinous lustre; is soluble in muriatic acid, with but a trace of insoluble residuum.

Twenty grammes of ore, and six grammes of borax, were submitted to an assay heat, in a crucible; the result of the assay was a black transparent scoria and a button of iron, weighing together 15.52 grammes; the iron alone weighing 12.90 grammes.

From this assay, this ore contains 64.50 per cent. of iron, having a fine texture, and is similar to steel in many of its properties.

Analysis of two varieties of Hydraulic Limestone from Virginia.

The blue limestone formation is of considerable extent in Jefferson county, Va. It runs from the Shenandoah river through Charlestown, dipping at various angles, to the Potomac, and finishes on the river a little below Shepardstown, at a locality called Butler's Mills, in several noble bluffs. The stratification is here very much inclined. The mass of the rock has a light blue colour, from which it takes its name, and is divided by veins of a limestone differing from each other, and from the mass in colour as well as in chemical constitution. Several varieties are quarried, and give, after calcination, hydraulic cement of fine quality, much of which has been employed on the Ohio and Chesapeake canal, and in the neighbourhood, for cisterns, and a variety of other hydraulic purposes.

I analysed two varieties of this limestone, the one was of a black colour, had a conchoidal fracture, and was susceptible of a fine polish, differing from the gray variety, inasmuch as the latter contains a greater proportion of alumina, giving the hydraulic properties, and is free from bituminous matter, the evident cause of the black colour observed in the first. These two substances being found in immediate contact with the blue limestone, I add an analysis of this rock from the same locality.

Black Limestone.

Alumina	0.152
Magnesia	0.082
Oxide of iron	0.014
Carbonic acid, water, bitumen	0.392
Lime	0.360
	1.000

Gray variety of Limestone.

Alumina	0.326
Magnesia	0.026
Oxide of iron	0.020
Lime	0.330
Carbonic acid and water	0.298
	1.000

Blue Limestone.

Alumina	0.048
Lime	0.512
Carbonic acid and water	0.414
Other substances, oxide of iron, &c.	0.026
	1.000

On the Dew-point Hygrometer in connexion with the Wet Bulb Thermometer.—By James P. Espy.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

The interest which observations upon the dew-point are now exciting throughout the scientific world, induces me to introduce the subject again to the readers of this Journal; particularly as I have made observations on the wet-bulb thermometer in connexion with the dew-point constantly for many years.

These observations were instituted with a hope that some law might be established by which the dew-point might be calculated—the temperature of the air and the temperature of the wet-bulb being given. I entered upon this investigation with more hopes of success, as I found it stated by Mr. Leslie, in the Supplement to the Encyclopædia Britannica, (art. Meteorology, if I mistake not,) that the ultimate temperature of a thermometer, surrounded with a wet rag, was the same whether it was placed in the wind, or in still air; and that the time alone in which it was cooled down to this point was affected by the velocity of the wind. In my first observations on these two instruments combined, I took this law for granted, as it was announced by such high authority, and accompanied by a very plausible explanation; but I had not proceeded very far before I perceived such discrepancies in my observations, as induced me to doubt the truth of Mr. Leslie's statement, and I immediately proceeded to test it by actual experiment.

I placed a naked thermometer, and one surrounded with a wet rag, near each other, in still air, where I let them remain until that with the wet bulb sunk as low as it would by evaporation below the temperature of the air; I then swung them both rapidly in the air together, and in all experiments of this kind which I have made, and they are very numerous, the thermometer with the wet bulb has fallen when swung, and risen again when at rest in still air. The quantity of depression varies with the distance of the dew-point below the temperature of the air; I have seldom in the middle of the day found it less than one degree, and have frequently seen it four degrees. I have found it absolutely necessary to swing the naked bulb with the wet bulb, otherwise very erroneous results will be obtained from the effects of radiation, as will appear by the two following experiments:

November 24th, 1833.

Temperature of naked bulb in still air,			67° Fahr.
Do.	do.	swung rapidly	70° do.
Do.	wet bulb in still air		57° do.
Do.	do.	swung rapidly	54½° do.

November 26th, 1833.

Temperature of naked bulb in still air			70° Fahr.
Do.	do.	swung rapidly	76° do.
Do.	wet bulb in still air		59° do.
Do.	do.	swung rapidly	57° do.

The dew point in the first experiment was . . .	38°
And in the last it was	35°

These experiments were made in a room where the walls were evidently colder than the air in the inside; for the naked thermometer in one of them, when swung, rose three degrees, and in the other six degrees, above the temperature indicated when at rest. If the wet bulb alone had been used in these experiments, it would have appeared by the first that it sunk by motion only, two and a half degrees, and by the second only two degrees; whereas by the aid of the naked bulb, it appears that the effect of swinging was in the first case five and a half degrees, and in the last case eight degrees.

The correctness of this deduction is rendered probable by an experiment on the 27th November, 1833, in which the wet bulb sunk on being swung from 62° to 55°, the naked bulb in both instances being 74°.

It is hoped that these observations will meet the eye of the meteorologists of Great Britain, who are now pursuing this subject with intense interest. It will free them from many embarrassing discrepancies in their observations made with a view to ascertain the relation which the three points of temperature under discussion have to one another.

It is manifest that this relation never can be discovered if the observations are made indiscriminately in the wind and in the still air.

The incorrectness of the assertion made by Leslie on this point, was shown by the writer of this article, in this Journal, in the year 1831, vol. vii.

It would appear, however, from the following passages in the second report of the British Association for the Advancement of Science, that it has escaped the notice of the members of that most respectable body:—

"Great as are the advantages of the simplicity of calculation with the dew-point experiment, there is a less direct experiment, which offers great facilities in performance, and likewise the means of self-registration. I allude to the moistened bulb hygrometer, in which the coolness produced is a function of the dryness of the atmosphere, *without bearing any relation to the force of wind or other circumstances which affect the rate of evaporation.*" Page 242.

Again the report goes on to say, in page 239—

"Saussure was not aware of the fact that *the coolness produced by evaporation of water from porous bodies, was independent of the rate at which the moisture was carried off by currents of air*—a want of knowledge which gave him much trouble."

Again, in page 248, the report on meteorology says,—"We cannot propose to meteorologists a finer problem for complete solution than that of the moist bulb hygrometer; which will require a close analysis of all that has hitherto been done on the subject. M. Gay Lussac who has communicated some valuable observations towards its attainment, thought it would never repay the labour of complete investigation. In the present state of science, however, we look upon

it otherwise, and feel strongly assured, that in a few years, the more direct method of the dew-point will be banished altogether."

I have not seen Gay Lussac's observations on this point, and we are not informed in the report how they were conducted, but from the experience of three years constant attention to this point, I am inclined to agree with Gay Lussac, especially in observations made at low temperatures.

To show the correctness of this conclusion, I have extracted from my journal a number of observations embracing a great range of temperature. By these extracts it will be seen that the discrepancies of similar observations are so great that it will be utterly useless to attempt, in low temperatures, to substitute the wet bulb hygrometer for the dew-point hygrometer unless a means can be found out to make the observations more nearly agree with one another. These observations were made in the open air, the wind sometimes blowing hard, and sometimes nearly calm, and this may be, in part, the cause of the discrepancies. But I am pursuaded that independent of this, the distance of the *iced bulb* temperature below the temperature of the air, when the dewpoint is down near zero of Fahr. is too small to afford any certain means of calculating the dew point from it, and the temperature of the air, even when the source of error above pointed out, is avoided.

These remarks, however, will not apply to the summer half of the year, and if a law could be discovered by which the wet bulb could be substituted for the dew-point hygrometer, even for half the year, a great advantage would be gained by the meteorologist.

There is another source of error which will cause great discrepancy in the results of different observations, if it is not guarded against, and that is, as I have frequently observed that the dew would not settle on the glass until it was cooled down four degrees below the dew-point, which was ascertained by cooling it down very gradually until it began to settle, and then wiping the glass very dry, and gradually letting the temperature increase, wiping off the dew very carefully as soon as it became visible, until it finally ceased to settle, the last temperature at which it was seen to settle, as the temperature of the glass was increasing, was frequently observed to be four degrees above the temperature at which it first settled.

I have also frequently seen the temperature of the wet bulb five degrees Fahr. below the freezing point without congelation, but upon touching the wet rag, congelation commenced, and the temperature immediately rose to 32°.

I intend this winter, during very cold weather, to use a ball of snow, as well as the wet rag for the moistened bulb hygrometer, and if I obtain results more accordant, I will lay them before the public.

Year.	Month.	Day.	Temp.	Wet bulb.	Dew Point.
1833	March	8	130*	76	28
1831	June	1	90	70	60
do.	July	19	89	73	64
do.	do.	20	89	75	68
do.	do.	23	89	76	70
do.	do.	31	87	78	73
do.	June	20	87	73½	68
do.	July	5	84	74	68
do.	do.	24	84	71	65
do.	June	12	84	71	64½
do.	do.	22	84	66½	55
1832	do.	15	84	77	73
do.	July	5	84	70	57
do.	do.	19	84	72	62
1831	do.	7	81	67½	59½
do.	do.	8	81	63½	52
do.	do.	13	81	71	66
do.	August	3	81	73	68
1832	May	19	80	70	65
do.	June	21	80	66	49
do.	August	21	80	70	62
1831	June	27	76	66½	61
do.	do.	15	77	70	65½
do.	do.	28	76	71	68
do.	August	6	76	64	55
do	July	9	76	72	70
1832	May	16	77	62	50
1833	April	1	68	50	{ 28 40
do.	do.	2	71	55	{ 32 39
1832	March	25	72	58	{ 44 44
do.	May	10	70	56	34
do.	June	1	71	58	45
do.	do.	8	71	65	57
do.	do.	9	70	63	56
do.	do.	20	71	58	{ 45 45
do.	September	1	71	61	49
do.	do.	3	71	65	60
do.	do.	25	65	55	45
do.	do.	13	64	54	44
1833	April	26	64	50	{ 33 31
do.	May	3	65	49	{ 28 37
do.	March	20	63	61	59
do.	April	6	63	{ 48 51 Still air	{ 23 40
do	do.	7	60	52	42
do	March	22	61	50	37½
do.	do.	31	63	49	{ 24 39
1832	November	30	56	52	48
do.	do.	26	54	46	38
do.	do.	10	53	44	31

* Artificial.

Year.	Month.	Day.	Temp.	Wet Bulb.	Dew Point
1831	October	28	55	45	33
do.	do.	29	53	44	34
do.	do.	30	56	48	39
do.	do.	22	54	52	49
do.	November	4	56	50	43
do.	do.	9	57	52	45
do.	do.	2	50	44	36
do.	do.	17	50	43	33
do.	do.	14	51	44	35
1832	do.	23	49	43	33
do.	do.	17	51	48	44
do.	October	29	51	42	31
1833	April	13	50	40	20
do.	do.	24	50	44 fresh.	34
do.	March	10	50	44 calm.	27
do.	January	4	51	47	37
do.	do.	3	49	45	40
1832	do.	14	51	43	31
do.	do.	15	51	43	32
do.	do.	16	49	43	35
do.	do.	17	47	43	37
do.	do.	20	48	41	29
do.	February	4	47	45	42
do.	do.	28	48	42	33
do.	do.	13	40	33	19
do.	do.	10	40	36	29
do.	January	21	42	37	30
1833	March	13	40	33	20
do.	do.	14	41	32	14
do.	do.	23	44	40½	34
do.	do.	7	38	32	18
do.	February	14	34	31	20
do.	do.	26	36	32	18
do.	January	26	35	30	10
do.	do.	29	34	31	16
do.	do.	29	29	26	12
do.	February	3	30	28	10
do.	do.	21	33	31	9
do.	January	12	23	20	2
do.	do.	11	20	14	— 3
do.	do.	16	24	20	— 2
do.	March	3	22	21	+ 2
do.	do.	4	20	19	— 2

Nov. 24, 1833	Temp. still air 67 do. swung 70	Wet bulb, still air 57 do. swung 54½	Dew point 38
Nov. 25.	do. still air 70 do. swung 76	do. still air 59 do. swung 57	Dew point 35

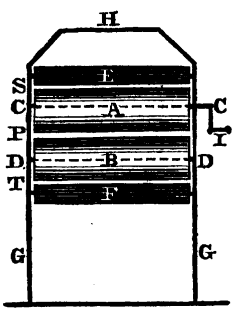
On Printing by Cylinder or Roller Presses.

TO THE COMMITTEE ON PUBLICATIONS.

Alps, Nassau, Rensselaer county, N. Y., Dec. 23, 1833.

Gentlemen,—Having given considerable attention to the examination of printing presses, and to their present manner of construction, operation, and execution, for the purpose of devising some more general and eligible plan than any now practiced, or at least some useful improvements, I now send you the result of my inquiries and reflections, desiring you to lay them before the public in the next number of the Journal of the Franklin Institute. It is my intention to prosecute them experimentally as soon as time and circumstances will permit. Perhaps, in some of my suggestions I have been anticipated; nevertheless the principles I have discovered, seem to me to be original and if reduced to practice, highly important. The importance of printing, as a means of multiplying information, so as to be diffused with facility and expedition to all parts of the world, is now generally recognised.

Fig. 1.



I proceed to illustrate by diagram and description, the principles of my theory of printing. In figure 1st. G H G represents a strong upright, and heavy frame, whose size, height, weight, and strength, must be proportional to the dimensions of its cylinder, A B E, and F. A and B represent two hollow or solid cylinders, of equal dimensions, both of whose superfices are to be set all round with movable types, or covered with curved metal plates. C C and D D represent the axes of the printing cylinders A and B. E represents the inking cylinder of the printing cylinder A; and F that of B. S, represents the space between the inking cylinder E, and the printing cylinder A. P, that between the printing cylinders A and B, between which the paper to be printed is to be run; and T that between the printing cylinder B and the inking cylinder F. I represents the handle by which the press is moved, by revolving, and is immediately connected to the end of the axis of the cylinder A. The four cylinders E, A, B, and F, are to be so connected at their extremities by cogged or grooved wheels, that by turning any one of them the whole will be moved. Their axes are to be so set in their frame G H G, by means of springs, screws, wedges, or slides, that they will admit of being set, so as to answer the various thicknesses of paper. Both of the printing cylinders A B being set with movable types, and the inking cylinders E, F, inked, and all set to answer the thickness of the paper, the handle I is to be turned round once, which will ink the types of the printing cylinders A, B, and then the paper to be printed being placed on a table of a height nearly equal to the space P, between the printing cylinders A B, is to be drawn through, which will be effected by the revolution

of the cylinders, in the same way that sheets of metal are drawn between rollers; this operation will print both sides of the paper.

Having described the cylinder press, and the manner of its operation, I will suggest a few particulars in its construction. It is evident that the faces of all the types must be curved, so as to answer the dimensions of their cylinders; that there must necessarily be spaces between the types to fasten them to their cylinders, and between their faces, to make the impression requisite for printing; and that where both the sides of the paper are being printed at the same time, some of the types in one of the printing cylinders may be pressing directly over these spaces, and consequently, unless the paper is very thick, will make an imperfect impression, if not tear or injure the paper considerably. Perhaps the like obstruction would remain even if the cylinders were covered with curved, stamped metal plates or stereotyped. To obviate this obstruction, or disadvantage, which seems to be the primary one, the relief or prominence of the letters on the types, or of the spaces between them, should be as small as possible. As every revolution of the cylinder will produce an impression on both sides of the paper, printing equally, and at the same time, copies can be multiplied as fast as the handle I, can be turned, and consequently from ten to forty impressions per minute may be obtained. Even if only one of the printing cylinders A B were set with movable types, or covered with curved, stamped, metal plates, the other being covered with some elastic substance, an impression would be given on one side of the paper at each revolution of the cylinder, and although two revolutions would thus be required to print both sides, this method might supersede the common one. The inking cylinders are intended to make two or three revolutions, or even more, to one of the printing cylinders, and to be supplied with ink from reservoirs fixed above, or on one side of them; so that the cylinder press may be worked constantly for hours, or days, or even weeks, and copies multiplied until the faces of the types are worn off.

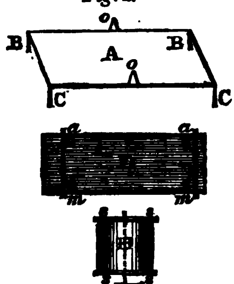
There may be various modes of setting movable types in cylinders and of fastening them; for example, the types may be tapering one way, and be screwed in tight; or may be square, and wedged in by wedge-like slips of metal as long as the cylinders, fastened at both ends thereto, and laying between them just so as to leave the letter of the type above. To obviate the necessity of type setting, which may probably be attended with some difficulty, the cylinders can be covered with curved, stamped, metal plates, as long as the cylinders, and either wide, or narrow, as practice shall determine to be best; these can be easily fastened to them by screws, slides, or nails. Such metal plates should be stamped, either before or after their attachment to their cylinders, so that the letters, figures, &c. on them will be as prominent as if the cylinders were set with movable types. This can be effected, as the plates of metal must be both ductile and malleable, by having them, when drawn out and smooth, placed on some even and hard surface or substance, where every letter can be stamped separately by stamps of steel or other hard and tenacious substance. The dimensions of the cylinder in this press, may be such

as to print at one revolution a volume of a thousand or more pages, the paper being of sufficient size, as one half may be set in type on one cylinder, and the other half on the other cylinder. The pressure between the cylinders can be increased or lessened at pleasure by bringing their faces nearer together, or removing them farther apart, by means of their setting screws, slides, &c., and thus can be made to answer all thicknesses of paper, as well as degrees of pressure.

The distinguishing characteristics of the cylinder press are, the simplicity of its construction, the regularity and uniformity of its motions, the rapidity and facility of its operations, and the equality of its pressure.

Havingdescribed the cylinder press, and suggested some particulars of its construction, I will now proceed to describe the rollerpress.

Fig. 2.



In fig. 2, A represents the frame of the roller press, which is to be made strong, and to be fastened in its place. B B C C represents its legs. D represents the carriage of the types, which runs, or moves, on very finely polished rollers *a m*, *a m*, movably attached to its under side, which are calculated to move or run directly backwards and forwards, between the legs B B, C C, immediately under the frame of the press A, on a level platform or smooth polished surface. *s s s s* represents the two longest sides of the carriage D of the types, which are to be toothed or grooved so as to answer to the teeth or grooves in the extremity of the cylinder H, which is calculated to give the desired impression. H represents the cylinder, which communicates the pressure, and which should be very heavy, covered with some elastic substance, and toothed, or grooved, to answer to the teeth or grooves *s s s s*, on the upper sides *a a m m* of the carriage of the types. I, is its handle, *s s s s* represents its toothed or grooved extremities: *o o* are the standards of the frame of the press, which sustain the supports of the axis of the cylinder H. The frame A being fixed, and the pressing cylinder H made to run or move in its standards *o o*, so as to move the carriage of the types, D, mounted on their rollers, *a m*, *a m*, directly backwards and forwards, between the legs B B C C, by means of their cogs or grooves. The handle I, is to be turned only partly round, and then backwards, so as to make all the types in the carriage D come so directly under the cylinder that the paper intervening will receive a sufficient pressure to be printed. The types in the carriage D are to be inked by inking cylinders, and hung to the frame A, by separate standards, and moved in the same way with the pressing cylinder H, and fixed so as to revolve just above them. The paper is to be laid on the types of the carriage D, to be printed, and when printed, taken off by the hands, while it moves backwards and forwards under the pressing cylinder. This press prints but one side at a time. The roller press can be made to print both sides of the pa-

per at the same time, by having the pressing cylinder H set with movable types, or covered with stamped metal plates, in the way already described for the printing cylinders of the cylinder press, and by having an inking cylinder attached to it to ink it. One side of the paper will be printed by the movable set types or stamped types on the cylinder H, and the other by those in the carriage D. Instead of the cylinder H being fixed, it can be rolled over the types; the carriage in which the types are set, being stationary and steadfast. With regard to the superiority of the cylinder over the roller press, as to construction, operation, and execution, there probably can be no rational doubt. Presses made on the principle of their construction, can be made to answer the size or dimensions of any paper, or even any number of papers, by having the cylinders enlarged and lengthened sufficiently.

Yours respectfully,

H. Strait.

FRANKLIN INSTITUTE.

Monthly Meeting.

The fourth monthly meeting for conversation on mechanical subjects, was held at the Hall of the Institute, on Thursday evening, December 26, 1833, when a model of the ingenious platform weighing machine, patented by Mr. Fairbanks, was submitted for examination. This machine is described at page 399, vol. xi., of this Journal.

Mr. Thos. W. Harvey, of New York, explained by reference to a model, a toggle joint press, invented by him, and intended to be applied to coining.

S. C. Walker exhibited a modification of a portable transit instrument, made originally by Jones, of Liverpool.

The object glass had been made to slide by rack-work, constructed by Mr. Young, mathematical Instrument maker of this city. The advantage of this change was stated to be, that the spider lines are liable to be less broken, as the focus is adjusted without disturbing the eye piece.

The spider lines having formerly been broken, Mr. Young had substituted new ones on a new piece of brass, divided by himself. The intervals between the spider lines had been found by repeated trials to be very nearly equal. The cylinders of the transverse axis had been turned anew, and were found to require no correction for bias of the instrument on reversing the axis.

Mr. Walker mentioned that two instruments on a similar plan were about to be constructed by Mr. Young, and that, judging from the manner in which these adjustments had been made, he had no doubt that they would be as good as those which are imported.

Reports of the Judges of the articles exhibited at the Eighth Exhibition of Domestic Manufactures; held by the Franklin Institute in October, 1833.

[Made to the Committee on Premiums and Exhibitions.]

Report of the Committee of Judges on Philosophical Apparatus.

The committee of judges appointed to examine the articles of philosophical apparatus, deposited at the exhibition just closed, congratulate the committee on premiums, upon the increased number and variety, and upon the improved execution, of the articles of philosophical apparatus exhibited, when compared with the deposits of the last exhibition. This branch of the mechanic arts is rapidly advancing, and the increased demand for its products, cannot fail to stimulate those who are now engaged in it to extend their range of business, and, perhaps, to induce others to embark in some of the various branches yet unoccupied. It will be of incalculable advantage to the cause of science, and to the improvement in instruction in the physical branches of education, that instruments for research and for illustration shall be at hand, and shall be procurable upon terms which may bring them within the reach of the, comparatively, limited means of many. The committee offer these remarks as explaining the details into which their report enters. In remarking upon the articles, the order of the list furnished to the committee will generally be pursued, this being understood to have been the order in which they were deposited.

Three globes, (terrestrial, celestial, and with an ivory surface,) by Josiah Loring, Boston, Mass.

These globes were carefully examined, that with the "ivory surface" attracting most attention; it is intended to teach students to trace the outlines of countries, &c. upon the sphere itself; the principal circles are permanently drawn for reference, and the tracing, when executed in pencil, is readily removed, by washing, from the surface. The other globes are creditable to Mr. Loring, the execution of the maps is good, their covering of varnish remarkably smooth, and transparent, and the mounting generally well executed. In both the globes, there is an irregularity of motion by which the points in the lines traced for the circles change their position in latitude, as marked on the brazen meridian, when the globe is turned upon its axis; a defect which should be carefully guarded against. The committee recommend that honorary mention be made of these globes.

Movable planisphere, deposited by T. T. Ash, intended for the use of schools.

Dial for a clock, by Thos. V. Blackmore, of Philadelphia.

Two pairs of scales for apothecaries, by Joseph Marshall.

Of these, one was a well finished pair intended for common use on the counter, the other, a balance for the more delicate operations of the druggist's shop. As a premium was offered for a delicate balance for apothecaries, the latter instrument was duly ex-

amined. In exterior finish and arrangement, it was superior to an instrument presented by the same maker two years since, but on trial it was not found as sensitive as the balance just referred to. The committee consider that this last point was the one to be particularly attended to, and that no attention to exterior finish merely, would justify them in recommending the award for the premium offered: this should be well understood, and, if the premium be renewed, attention called particularly to the perfection of the working parts. The balance examined had been for some time in use, and allowance should be made for this fact. The committee recommend an honorary mention to be made of the workmanship of Mr. Marshall.

Ecliptico planetarium, by James Swaim.

A box of mathematical instruments, by J. Millington.

Three models of steam engines, by J. Millington, the first, the model of a high pressure engine, the second, of a low pressure engine as made by Maudesley, of London; the third, a Boulton & Watt low pressure engine. The execution of these models was remarkably neat, and the last mentioned, attracted particular attention from its finish. The committee have ascertained that these engines were commenced in England, and finished in this country, by the maker, who is now settled in this city; they have received no account of the prices fixed upon them, though they understand them to be specimen articles. They would recommend the maker for an honorary notice.

Three air-pumps, made by Alva Mason, Philadelphia, mechanical powers, electrical machine, pyrometer, Hare's eudiometer, models of pumps, tube for electricity in vacuo, mercurial shower, mouth blowpipe, stop-cocks, &c., Hare's hydrogen apparatus, various articles of electrical apparatus.

The largest of the air-pumps (price ninety dollars,) deserves particular attention for the neatness of its workmanship; the articles generally support the character which Mr. Mason has attained in his branch of business. The pyrometer is of the form intended for illustration, showing expansion by heat, and the subsequent contraction on cooling. Hare's eudiometer has been modified, the committee suppose with a view to reduction in the price; they conceive that dispensing with the spring valve, will not facilitate manipulation with it. The models of pumps are very neat. The form given to the glass for the mercurial shower, is particularly appropriate. The committee recommend that honorary mention be made of Alva Mason for the articles of philosophical apparatus deposited by him.

Two time keepers, of excellent workmanship, by Mr. Fatton, one with a horizontal, the other with a vertical balance.

Models of crystalline forms, by John Cooper.

Compound microscope, by John Boggs.

A double barrel air pump, of large size, by Samuel Coltman; this instrument competes very successfully with that already referred to as made by Alva Mason, and some of the parts have, in fact, a higher finish: the difficulty of obtaining brass castings entirely free from flaws, was apparent in both the pumps.

Self-acting blow-pipe, alcohol blow-pipe, by J. Millington; very neat in form, of good workmanship, and well worthy of the attention of those who use this variety of the blow-pipe.

Improved turned compass sights, by B. Stancliff.

Clock, by Bladenburgh & Jones.

Model of a low pressure engine, by Joseph Moore.

Hemispheres, (Magdeburg,) by Joseph Wyepp.

Tellurian, by W. R. Thomas, of Lancaster, Pennsylvania. This instrument, which is intended to exhibit the motions of the earth and of her satellite, is well put together, and the parts which belong to the depositors are so combined with others as to represent effectively the intended motions: the instrument might be made usefully to subserve the purposes of the instructor in astronomy.

Improved compass and goniometer, by Wm. J. Young. The compass has a telescope attached, and as well as the goniometer, is intended for the purposes of the civil engineer; in particular operations they would no doubt prove useful. The workmanship is in good style.

Trammel, for drawing eclipses, by J. Millington, a very neat and effective instrument.

Compass by J. Millington.

Achromatic pocket telescope, spectacles, achromatic object glass, various lenses of different focal lengths, by J. Schnaitman. The lenses attracted special attention by their finish; the object glass was small, but the lenses constituting it beautifully ground; the committee had no means of testing its achromatism, as it was not mounted: they hope that Mr. Schnaitman will persevere in a branch in which he seems so successful.

A. D. Bache,
Joseph Roberts.

Report of the Committee of Judges on Lamps.

The committee of judges of lamps for the annual exhibition of the Franklin Institute, beg leave to report—

That they have been highly gratified with the richness of colour, beauty of form, and exquisite finish of the lamps, both astral and mantel. The mantel lamps of C. Cornelius & Son, were particularly admired; the brass castings are graceful and durable, and exhibit a great richness of hue. The bronzing is decidedly superior to that of former specimens, and while it is of a fine tint, is said to stand the action of air, of weak acids, and alkaline solutions, proving its resemblance in these important particulars to the best English productions of the same kind. The cast pillar icicles, by which they are decorated, are of English make, but the cut glass dishes, tops, and lamp glasses are American, of perfect transparency, and tasteful cutting. We were much pleased with a very simple contrivance to lessen the quantity of leakage into the escape cup, by which the trouble and soil of the cleaning operations are much lessened. The astral

lamps of the same artists are remarkable for new, original, and delicate forms, excellent bronzing, and moderate price, affording in every particular, evidence of steadily progressive improvement.

The committee were not less pleased with the lamps of anthracite coal from the factory of J. W. & E. Kirk. In the selection of coal, the choice of forms, and the beauty of polish, we discover great improvement, and much to praise. The quantity of this article sold by the makers, indicates the public suffrage in its favour, and a confidence in its durability, which we were not prepared to expect. Time and use improve its lustre, oil does not injure it, and it is only by the same accidents to which glass is liable, that its safety is put in jeopardy.

The committee of judges call the attention of the committee on premiums particularly to the beautiful glass mantel lamps from the New England Glass company, deposited by Mr. Muzzey. The cast pillar icicles, and other pendulous ornaments of these splendid lamps, are the first of the kind presented to the public from American sources, and they bear a strict scrutiny for transparency, lustre, and workmanship. The Company have, with much labour, and at great expense, overcome the various difficulties presented in their production, and expect their reward in the public patronage.

The gig lamps by T. Crease, from Horn & Kneass, are creditable specimens of workmanship. The structure is simple. We think, however, that the cut glass windows are injurious to the proper direction of the light, and believe the reflectors might be improved by being plainer. The plating struck us as very good.

Among the lamps we observed the liquid gas lamps of Isaiah Jennings, who has the merit of having succeeded in effecting a combination between the vapour of spirits of turpentine and alcohol, in such proportions as to obviate the offensive smell of the former. The lamps require very little attention, either in use or preparation, and afford a pleasant light at a cost rather less than that from the best sperm oil. The hazard of handling the combustible liquid is the only apparent objection to its use, and as the lamps, when trimmed, are perfectly safe, the preparation of them for daily use should be confided only to discreet hands.

The only other article to be noticed is the creditable attempt of J. M. & G. Truman, to make an improvement in the street lamp for burning oil. The principle is, the elevation of as much as possible of the flame above the wick, so as to prevent its absorption of the light. This is effected by bringing a circular aperture in a metal plate immediately over the burning wick, and by the aid of a long chimney making a strong draft, by which the gas generated by the heated wick is rapidly driven up and burned above the circular aperture. The idea seems good, but the means of reducing it to practical use are not yet adequate to the production of a cheap and manageable effect. The committee hope the Messrs. Truman will continue their praiseworthy exertions.

S. C. Atkinson, Woodbury, N. J., submitted a draught of a lamp for burning imperfect oil in cold weather. It is simple and ingenious,

but, in its present form, liable to several objections, applicable to every lamp in which the reservoir is placed above the flame, and subjected to heat. If the reservoir be air-tight, the heat forces out the oil; if not, gravitation does it. The Saturn lamps are made on this principle, and they have often been reproduced, but as often abandoned.

J. K. MITCHELL.

REPORT OF THE COMMITTEE ON WEIGHTS AND MEASURES.

*Appendix to the Report of the Committee of the Franklin Institute on Weights and Measures.**

In compliance with the appointment of the Board of Managers, a meeting of the committee was held at the Hall of the Institute, June 20, 1833.

When T. McEuen, M. D. was requested to examine the papers and reports made on weights and measures in France, and condense the same, in a report for the use of the committee.

Mr. Sears C. Walker, to perform the same duty with regard to papers and reports made in England, and

Professor Alex. D. Bache to report on the proceedings on the same subject in the United States.

At subsequent meetings of the committee, held at the Hall of the Institute, August 1st and 3d, 1833—the gentlemen before referred to, presented their reports, which were read, and ordered to be printed, for the use of the committee—

On motion, Dr. Moore was requested to furnish the committee with the authentication of the Troy pound used in the mint of the United States—which document was also ordered to be printed.

Report on the Weights and Measures of Great Britain. By S. C. WALKER.

The subscriber having been instructed to inquire concerning the means used in Great Britain for procuring an invariable standard of weights and measures, respectfully submits the following report.

All standards of length, weight, and capacity, may be arranged under three general divisions.

I. Variable natural standards.

II. Artificial standards.

III. Invariable natural standards.

I. The barley corn, the foot, the ell, the span, the cubit, and the hand, are all variable natural standards of length. The dry grain of barley corn, taken from the middle of the ear, is a variable natural standard of weight. The vessel that contains a definite number of

* We have deemed it adviseable to present to our readers these documents, which are necessary to a full comprehension of the report to which they are appended. COM. PUB.

these grains of barley corn, is a variable standard of capacity. These vary in different countries, in different years, in different fields, and in different parts of the same field, and can never lead to certain or accurate results.

Yet, defective as these standards are, they alone can enable us to estimate the value of legal measurements and weights made in Great Britain previous to the date of the discovery of this country by Columbus.

Weights and measures previous to A. D. 1492.

It appears from some ancient chronicles, that uniform weights and measures were established by law before the conquest by Canute. The value of these weights and measures is not known. The laws which regulated them were not well enforced. Henry I. ordained that his arm should be the standard for long measures. Richard I. caused standard measures of length to be made of iron, those of capacity with iron brims, and directed that these, as well as standard weights, should be kept by the sheriffs and magistrates of the towns. The value of these measures is unknown.

Magna Charta, A. D. 1215, ordains that there shall be one uniform standard of weights, and measures, and of capacity—and that this standard shall be the London quarter. This London quarter continued to be the standard till Henry VII. A. D. 1491. Various acts were passed in this period of 276 years, by successive parliaments, respecting the distribution of the standards among the sheriffs of the different shires and towns; for an abstract of which see Kelly's Metrology, pp. 67 et sub.

The magnitude of the London quarter is not precisely known: we can recompose it from the variable natural standard on which it was based, viz. "the dry grains of barley corn taken from the middle of the ear." Of these 32 make an English penny, called a sterling round without clipping: 20 pence make an ounce; 12 ounces a pound; 8 pounds make a gallon of wine; 8 gallons of wine make a London bushel; 8 bushels make a London quarter. (See 51 Henry III. Stat. 1. cap. 3. 31 Edw. I. 12 Henry VII. cap. 5.)

It is obvious, that every attempt to construct the London quarter from this variable element, the barley corn, must be unsatisfactory. No copy of the London quarter has been preserved, nor is its precise relation to any artificial standard now preserved, known with certainty.

The Winchester bushel deposited in the king's exchequer by order of Henry VII., A. D 1491, is the oldest measure of capacity now preserved. This was ordered to be made in conformity to the ancient standards of the realm, then in the king's exchequer. Our uncertainty concerning the size of the London quarter, of which this bushel ought to be the eighth part, will always be equal to our uncertainty whether the order was faithfully executed, and whether the bushel then in the exchequer was a fair measure of the bushels in use during the three centuries preceding the time of Henry VII.; a point concerning which no authentic accounts are preserved.

II. Artificial standards may be made of iron, of brass, of silver, platinum, &c. The last substance is, probably, the best and most dur-

able; but all are liable to slow decomposition, and were they not so, would be liable to loss and destruction.

Standards of length, and capacity, and weights preserved.

The standards of measure, of length, and capacity, in use in Great Britain since the 11th year of Henry VII., A. D. 1491, are now preserved in the king's exchequer. The standard weights in use in the 31st. Elizabeth, A. D. 1588, are now in the same exchequer. All the modifications which they have undergone by successive acts of parliament, are recorded, and copies of the modified artificial standards are preserved. These standards have all of late been referred to invariable universal natural standards. They have thus become virtually imperishable. Hence we may conclude that in all future time, the legal measurement of length and capacity made since 1491, and the legal weights made since 1588, may be estimated with any degree of accuracy desired.

Referred to invariable standards.

As no change had been made in the laws for constructing the standard avoirdupois pound for six centuries previous to 1824, it is probable that the legal avoirdupois pound now in use in Great Britain, is a fair representative of the ancient pound of the Magna Charta.

Pound avoirdupois.

The pound avoirdupois meaning "the pound to have," that is, the pound for buying, a lighter pound used, having been contrary to statute, for selling, is the ancient standard pound of the Magna Charta. It is called by various names in the old statutes. In 11th Henry VII. it is erroneously called troy. In 24th Henry VIII. it is haberdepois; in Elizabeth's time it is called averdepoiz. It contained 7680 grains by the assize law, previous to 1758. Yet in 1699 it was found to contain only 7000.25 of the grains then in use. The mass of the pound had not varied. Whether the grains of barley had grown heavier, or the artificial grains had changed, is left wholly to conjecture.

Pound troy.

The pound troy was not made legal till 1758. It contained 240 pennies. The pound avoirdupois contained the same number of pennies. The troy penny contained 24 grains of barley. The sterling penny, from which the pound avoirdupois was constructed, contained 32 grains. At what time the light pennies were introduced into use is not determined. Perhaps the examination of ancient pennies might enable us to decide.

The standard gallon contained eight pounds of wine according to some statutes, and eight pounds of wheat according to others. The gallon of eight pounds of wheat, was of greater capacity than that of eight pounds of wine. These gallons, constructed from variable standards, were liable to variation. To remedy this, in 1699, 12th William III., it was enacted that the wine gallon shall contain 231 cubic inches, and the beer gallon 282 cubic inches. Thus a fixed proportion was established between them. In 1699 the Council of the Royal Society found the Winchester bushel of Henry VII. to contain 2145.6 cubic inches, and the bushel of water to weigh 1131 ounces 14 pennyweights troy. They also found that 7000.25 troy grains were equal to a pound avoirdupois. Of these grains 5780 were equal to a pound

troy. This was made the legal proportion between the avoirdupois and troy pounds in 1758.

Standard pound troy by Harris.

In 1758, 32nd George II., a committee of parliament instructed the celebrated optician, Mr. Bird, to prepare a standard yard which should be a mean of all the yards in the exchequer; of this several copies were deposited in the exchequer.

They also instructed Mr. Harris, the King's assay master of the mint, to make a troy pound, of which a copy, with several parts of the pound troy, were deposited in the exchequer. They also directed avoirdupois pounds containing 7000 grains troy, to be placed in the exchequer, with Mr. Bird's balance, by which they were adjusted.

In 1685, some gentlemen at Oxford determined the weight of a cubic foot of spring water, or 1728 cubic inches, to be 1000 ounces avoirdupois. This established a fixed proportion between the measures of weight and capacity. By this rule the standard bushels were constructed till the year 1824, when the assize laws for capacity were changed.

Comparisons of the standards in the exchequer with Sir G. Shuckburgh's scale, by Troughton, the comparisons made by Shuckburgh, in 1796.

Number of trials.		Date of construction, A. D.	Length in parts of Sir George Shuckburgh's scale.	Difference.	Probable error of graduation.
36	Standard of Henry VII.	1492	35.924	—.076	.03
"	" yard of Elizabeth	1588	36.015	+.015	.04
"	" ell " "	"	36.016	+.016	.04
"	Yard bed of Guildhall	1660	36.032	+.032	
"	Ell " "	"	36.014	+.014	
"	Standard of Clockmaker's Co.	1761	35.972	—.028	
"	Tower standard, by Rowley	1720	36.004	+.004	
"	Graham's standard line E.	1742	36.0013	+.0013	
"	" " Exc'r.	"	35.9933	—.0067	
"	Gen. Roy's (Bird's) scale	1745	36.00036	+.00036	.0003
"	Mr. Aubert's " } 1745 to	1750	35.99880	—.00120	.0006
"	Royal Society's } 1745 to	1750	35.99955	—.00045	.0004
"	Bird's parliamentary standard	1758	36.00023	+.00023	
" " "	Bird's parliamentary standard, since called the imperial standard,	1760	36.00002	+.00002	
" "	Troughton's, since called Sir George Shuckburgh's scale	1796	36.00000	+.00000	.0001

Hence the mean length of the standard yards preserved in the exchequer is 0.003 of an inch, in the first seven inches, shorter than Sir George Shuckburgh's scale, and consequently 0.003 inch shorter than the imperial standard.

Comparison of standards by Kater, 1821.

The following is the report (Philosophical transactions, Lond. 1821, p. 91.) of Capt. Kater of the lengths of some standards, in inches of Col. Lambton's scale, used in making the trigonometrical survey in the East Indies.

	inches.
Sir George Shuckburgh's standard .	36.000642
Bird's, 1760, since styled "imperial," .	36.000659
Roy's . . .	36.001537
Ramsden's bar, used in making the trig. survey of Great Britain, . . .	36.003147
Col. Lambton's scale, . .	36.000000

In the London Philosophical Transactions, for 1830, Capt. Kater reports the lengths of several standards, in inches of the "imperial standard."

	inches.
Sir George Shuckburgh's scale, . .	3 00018
Russian scale, . . .	35.99932
Dollond's scale, . .	35.99908
Capt. Kater's scale, . .	35.99879
"Imperial standard," . . .	36.00000

Hence it appears that Dollond's scale, which by careful comparisons in 1820 and 1824 appeared to differ little, if at all, from Sir George Shuckburgh's scale, was, in 1830, no less than 0.0011 inches in defect.

Second determination.

	inches.
Shuckburgh's scale, . .	36.00009
Russian do.	35.99929
Dollond's do. . .	35.99893
"Imperial standard," . .	36.00000

Division III.—Invariable natural standards. Earth's circumference.

III. The meridional circumference of the earth, and the duration of the earth's rotation on its axis, are two invariable natural standards: the former of space, the latter of time. These are available at all parts of the earth's surface, and at all periods of time. The measurement of a definite portion of the former, gives one of these standards.

The mode of making this measurement, and the results deduced from it, are given at length in the able report of Dr. M'Euen.

Earth's rotation.

The duration of the earth's rotation is a natural standard measure of time. An artificial relation

between this measure of time, and the measures of length, may be established by means of the pendulum, which makes one vibration in a definite portion of this duration.

Earth's gravitation.

The length of such a pendulum becomes a standard of measures of length. The same law of universal gravitation which preserves the invariability of the shape and length of the earth's meridional circumference, preserves at each point of that circumference a moving force invariable at that point. If we could subject a pendulum to this moving force alone, making complete abstraction of all other resisting or disturbing forces, it is obvious that the same pendulum would, in all ages, perform its vibrations in the same definite portion of the time of the earth's rotation, and in the same amplitude of arc, the effect of temperature only excepted.

Effect of temperature.

By virtue of the principle of the conservation of areas, an expansion of the pendulum from an increase of heat would cause a diminution of amplitude of arc, and an increase in time of vibration.

Siderial day.

Mean solar second.

If, again, we suppose a pendulum subjected to the single force above mentioned, and assume a standard temperature 62° Fahrenheit, for instance, we shall have an invariable pendulum, vibrating in an invariable arc, in an invariable duration of time. If we divide the period of the earth's rotation on its axis, as now reckoned by astronomers into 8640 equal parts. 1.00273791 of these parts will be a mean solar second as now used by astronomers. The duration of this second is invariable. La Place has demonstrated that it could only vary from one of three causes. 1st. A change in the earth's mean secular motion in right ascension; 2nd, from a removal of a considerable portion of the earth's mass towards, or from, the equator; 3d, from a diminution of the earth's equatorial semidiameter, by loss of heat.

Invariable, but subject to a small equation.

The mean disturbing effect of the first is 0. There are no causes now in operation to produce the second. The third cause has not changed the duration of a day a thousandth part of a second in two thousand years. The mean solar second is subject, however, to an equation of one second in three years. (See Herschel's Astronomy, No. 274.)

Kater's standard.

Length of seconds, pendulum at London in vacuo—at level of sea—at 62° Fahr.

Shuckburgh's scale.

Bird's scale, 1760.

The pendulum vibrating in a mean solar second at Mr. Browne's house, London, by virtue of the above mentioned invariable moving force at the above standard temperature, 62° Fahrenheit, was measured by Capt. Kater, in 1818, by instructions from a committee of Parliament. In 1819, it was by him reported to be in length 39.1393 inches in parts of Sir George Shuckburgh's scale, which is identical within the limits of possible comparison with Bird's scale of 1760, which was, in 1824, by an act of parliament, made the "imperial standard yard," and only unit of measures of length in the United Kingdom of Great Britain.

"Imperial standard."

Metre, or 1-40,000,000th part of earth's circumference.

This "imperial standard" contained 36 inches, of which 39.3708 inches of brass at the temperature of 62° Fahrenheit, are equal in length to the forty millionth part of the earth's meridional circumference, and equal in length to the platinum standard metre of France, at the French standard temperature, namely, that of melting ice (0 centigrade, 32° Fahrenheit.) The expansion of brass being for 1° Fahr. 0.0000099590, Kater's estimate, and that of platina for 1° Fahr. 0.0000047583 Borda's estimate.

Expansion of brass.

Expansion of platinum.

"Imperial standard troy pound."

Harris' standard pound troy was made by the same act the "imperial standard pound troy," containing 5760 grains, of which 252,458 grains were equal in weight to a cubic inch of distilled water, weighed in air, with brass weights, at the temperature of 62° Fahrenheit, the barometer being at thirty inches. Seven thousand of these grains make a pound avoirdupois.

Pound avoirdupois.

"Imperial standard gallon."

The imperial standard gallon contains 10 pounds troy of distilled water, at same temperature, and same atmospheric pressure.

The following standards were deposited in 1826 in Westminster, and at the Royal Exchequer:—

1 Imperial standard yard, with gold points.
1 " " " " steel terminations.
1 Imperial troy pound.
1 Avoirdupois pound.
1 " " in a box with smaller weights.
1 Weight of imperial gallon of water.
1 Imperial gallon measure.
1 Bushel.
1 Quart.
1 Pint
A copy of the imperial gallon, quart, and pint.
1 Bushel.
1 Half bushel.
1 Peck.
1 Gallon.
1 Half gallon.
1 Pint.
1 Half pint.
1 Gill.
1 Half gill.
1 Set of avoirdupois weights, from 56 lbs. to half a drachm.
1 Set of counterpoises for above set of weights.
1 Set of troy weights, from one pound to one grain, with counterpoises for each.

Standards deposited at Guildhall, Edinburgh, and Dublin.

1 Imperial standard yard, with gold points.
1 " " " " steel terminations.

1 imperial troy pound.
1 Avoirdupois pound.
1 Weight of imperial gallon of water.
1 Imperial gallon measure.
1 Bushel.
1 Quart.
1 Pint.
1 Set of avoirdupois weights, from 56 lbs. to half a drachm.

The following considerations may be adduced in favour of the adoption of the imperial standards by the legislature of Pennsylvania.

1st. Now legal.

1st. Those of length and weight appear to be the legal standards of Pennsylvania at this time. They were the standards of England in 1760. They were at that time properly the standards of the colony of Pennsylvania, and unless some act of legislation has since passed on the subject, no other standards are at this time legal in Pennsylvania.

2nd. Least loss.

2nd. The adoption of them will cause the least destruction of legal property in the form of legal weights and scales in Pennsylvania.

3d. Mean of ancient standard.

3d. These standards are the mean of the parliamentary standards in use in England since the first discovery of this country. They ought, therefore, most nearly to represent the mean of the measures of length and the weights used in this country since its first settlement.

4th. Easily recovered by arc of meridian.

4th. Should these standards be destroyed they may be easily recovered by the measurement of a definite portion of the earth's meridional circumference; or by measuring the mean solar seconds pendulum, corrected for terrestrial latitudes by rules to be given hereafter.

5th. By second's pendulum.

5th. The meridian of London is virtually our prime meridian. Our calculations for astronomy and navigation are based upon it. The longitude of Philadelphia from London is better known than its longitude from Harrisburg, and quite as well as its longitude from Washington.

The seconds pendulum for a vacuum, and for the level of the sea, and for 62° Fahrenheit, varies with the latitude. The adoption of the "imperial standard" would make the latitude of London in this respect the prime latitude. The different formulæ for expressing the length of the mean solar seconds pendulum in a vacuum, at the level of the sea, and at 62° Fahrenheit, for any latitude, in parts of the "imperial standard yard," are

(1)······Seconds pend. $= 39.01612 + 0.20208 \times \mathrm{Sin}^2$ Lat.
(2)······Seconds pend. $= 39.01554 + 0.20347 \times \mathrm{Sin}^2$ Lat.
(3)······Seconds pend. $= 39.01307 + 0.20644 \times \mathrm{Sin}^2$ Lat.
(4)······Seconds pend. $= 39.01228 + 0.20805 \times \mathrm{Sin}^2$ Lat.

Reduction for latitude.

These four different formulæ are taken from Bowditch's notes to the "Mécanique Celeste," vol. vii. p. 480 [2055 p.] and [2055 x.] The coefficients for the first formula are deduced from 52 observed lengths of the seconds

pendulum in different latitudes, on the principle that the sum of the squares of the errors is a minimum. The second is from Boscovitch's theorem applied to the same. The third and fourth formulæ are deduced in the same manner from 44 of the most uniform of the same 52 observations. It is difficult to say which is most correct; it is probable that either will give the length of the pendulum to the five hundredth of an inch.

Vacuum. Thermometer. Level of sea. Indefinitely small arcs.

By means of one of these formulæ, and of others appended to this report, for reduction to a vacuum, to the level of the sea, to 62° Fahrenheit, and to indefinitely small arcs, it will be in the power of every scientific man to verify, or recover, if lost, the "imperial standard yard." He can then measure a cubic inch of distilled water, or any multiple thereof, at 62° Fahrenheit, and 30. ins. of the barometer, and verify, or reconstruct, the brass troy grain, so that 252.458 grains, or any multiple thereof, shall be equal in weight to the cubic inch of distilled water, or like multiple thereof. He can then verify, or reconstruct, the "imperial standard pound," and the "imperial standard gallon," as above mentioned.

Reconstruction of troy grains.

Pound and gallon.

Seconds pendulum at New York.

The seconds pendulum in New York, lat 42° 42′ 43″ North, was measured in 1828, by Messrs. Renwick and Sabine, and was by them reported to be in vacuo, at sea level, at 62° Fahrenheit, 39.10120 inches of Sir George Shuckburgh's scale. This length is within 0.00037 inches of the length of the seconds pendulum for same latitude, deduced by calculation from the mean of 44 of the best measurements of the pendulum made in different parts of the earth's surface, assuming the compression at $\frac{1}{300}$. See Bowditch's notes to "Mécanique Celeste," as above.

Confusion from discrepancies in standards.

If a seconds pendulum were measured in Washington, Philadelphia, Harrisburg, and Pittsburg, their lengths might be recorded in parts of the "imperial standard yard." These would furnish additional facilities for the recovery, or verification, of them. It would still be well to use the imperial yard; for if Pennsylvania should adopt a different yard referred to some local measurements of the length of the seconds pendulum, other states might adopt a different standard yard, referred to the seconds pendulum of the latitude of their capital; endless disputes about the measurements and weights would ensue in the United States' courts, and the decision of them would become a subject of astronomical jurisprudence.

Shuckburgh's scale.

7th. The celebrated Mr. Troughton constructed, in 1796, for Sir George Shuckburgh Evelyn, a very accurate scale, liable, in its divisions, to no greater error than 0.0001 in. This scale differs by not more than 0.00002 in. from the "imperial standard;" in other words, it is identical with it. With this scale all the standards in the exchequer, including all those with which trigonometrical surveys have been made in Great Britain, have been frequently and carefully compared. The results of their surveys are thus referred to the "imperial standard." The possession

and use in this country of the same standard would facilitate comparisons of trigonometrical surveys made here, with those made in Great Britain.

8th. Sir George Shuckburgh's scale was compared in 1802, with the French metre, by Professor Pictet, of Geneva. Hence this scale, and consequently the "imperial standard," would enable us to compare with facility measurements made here with the trigonometrical surveys made by the French government, and, through their labours, with continental measurements in general.

Pictet's metre of France.

9th. The difference in the length of two pendulums made by Mr. Whitehurst, and vibrating 42 and 84 times in a mean solar minute, at 113 feet above the level of the sea, at 60° Fah, and 30. ins. barometer, is 59.8938 inches of the "imperial standard." We have thus a third invariable natural standard. This may be called the differential pendulum. The invention of the convertible pendulum, by Kater, and the zeal with which observers have multiplied observations with it, aided in their formulæ for reduction by the first analysts of Europe, have prevented the observations of Whitehurst from receiving the attention that is due to them. Some discrepancies detected in the results of Kater's convertible pendulum, vibrating on knife edges, within the last two or three years, together with the difficulty of fixing the constants, in the formulæ for reduction, for latitude, pressure, temperature, altitude, and length of arcs, may yet direct the attention of observers to the differential pendulum of Whitehurst, which does not admit of so accurate admeasurement, but will probably be found to have fewer variables in its formulæ for reduction.

Whitehurst's pendulum.

Sir G. Shuckburgh also found by a great number of trials, that a cubic inch of a scale 0.0002 in. shorter than the "imperial standard," since adopted, at barom. 29.74 inches, therm. 66°, weighed 252.422 grains, since made parts of the imperial standard.

Cubic inch of distilled water weighed.

He found by repeating Whitehurst's measurements with the *differential* pendulum, the same results as those given above.

The "imperial standard" pound troy made by Harris with a two-pound and another pound weight, made by the same, when compared with Troughton's weights, by Shuckburgh, gave the "imperial standard" pound equal in weight to 5763.78 grains of Troughton.

In the statement of the length of the mean solar seconds pendulum, in any given latitude, at the level of the sea, and at 62° Fahrenheit, the invariability of its length was inferred from the invariability of the moving force.

The search after the length of this pendulum in different latitudes, has occupied much of the time of the most careful observers, and most skilful analysts of Europe, for the last fifteen years.

But though such an invariable force exists in nature, we can never in practice separate it from other forces which modify the observed length of every seconds pendulum.

These forces are,—friction at the point of suspension, resistance of

the medium passed through, terrestrial and electro-magnetism, and, probably, the attraction of mountains, and the variable density of geological strata. It has been customary for observers to use a convertible pendulum vibrating on knife edges, whose distance from each is adjusted by tangent and friction screws, in such a manner that the pendulum makes nearly 8640 vibrations in a mean solar day, whether suspended by the one or by the other knife edge.

Convertible pendulum.

Coincidences.

As the pendulum has no maintaining power, and does not vibrate continuously through the whole day, its coincidences with the pendulum of some standard mean solar, or siderial clock, carefully regulated by frequent celestial observations, are noted, and recorded, together with all the varying circumstances of

1st. Amplitude of arcs at beginning and end of each coincidence.

2nd. Height of the thermometer.

3d. Height of the barometer.

The amplitude of the arc should not exceed 1° 30′.

The number of coincidences, and amplitude of arcs, should be nearly the same with both knife edges.

The agate planes on which the knife edges rest, should be firm, smooth in the concave surface of the grooves, and well levelled, so that a removal of the knife edges 180° in azimuth, shall cause no change in the number of vibrations between the coincidences.

Measurement of length.

The observer then measures the distance of the knife edges, the absolute and specific gravity of each part of the pendulum, together with the distance of the same from each knife edge; the pressure of the atmosphere, and the temperature of the air, and of each weight, or measure, used in making these estimates. The duty of the observer is then finished, if his estimates are made with sufficient care; the actual length of the seconds pendulum affected by all these disturbing forces, will have been reported by him without an error of more than 0.0001 inch.

Limit of accuracy of measurement.

It appears from Baily's paper on the pendulum, Lond. Philos. Trans., 1832, that the observations of Kater, on which the length of the imperial standard yard now rests, were liable to error from too great amplitude of arcs, and from his omission to measure and report the effect upon the number of vibrations of change of each knife edge through 180° of azimuth.

The height of the place of observation above sea level, and its latitude, must also be measured and reported.

Corrections required.

The requisite observations and measurements having been made, it belongs to the analyst and theorist to assign to each of the disturbing causes, its proper effect upon the reported diurnal number of vibrations, and to correct this number for the same, and thence to deduce the length of the theoretical, or comparable, mean solar seconds pendulum, due to the single force above mentioned, acting at that point of the earth's meridional circumference. In making these corrections, several constants are used, the value of which is variously estimated by different observ-

ers. By using the same formulæ, and the same constants for the corrections, Kater's and Biot's separate and independent observations on the length of the seconds pendulum at Unst and Leithfort agree within the limits above stated, viz. 0.0001 inch.

Agreement of Kater's & Biot's observations.

By using the formulæ and constants employed by different calculators and observers of equal celebrity and authority, we find discrepancies between the estimated and observed lengths of the mean solar seconds pendulum, corrected as above, at the same place, of at least 0.0007 inches.

In the present state of science, we may therefore conclude that the limit of accuracy in the estimated seconds pendulum, even at London and Paris, is 0.0007 inch.

Limit of accuracy at London, Paris, and other places.

In other latitudes, where the seconds pendulum is estimated from the report of a single observer, the limit of accuracy is not less than 0.001 inch. This is the case with the latitude of New York city, where the length of the seconds pendulum rests upon the observations of Messrs. Renwick and Sabine. Where the length of the seconds pendulum has not been measured by actual experiment, the formulæ above given for correction for latitude, will give the length of the seconds pendulum within the limit of accuracy of 0.002 inch.

We may therefore conclude that the length of the seconds pendulum at Washington, Philadelphia, or Harrisburg, may be determined from theory, without observations, within one five hundredth part of an inch.

Limit of accuracy of theory for Philadelphia, Washington, or Harrisburg.

Corrections to be applied to the number of vibrations of an invariable pendulum.

For arc. $$\text{Correction} = + N \times \frac{\sin(A + d) \times \sin(A - a)}{32\,M\,(\log\sin A - \log\sin a)}$$

For rate. $$\text{Correction} = + N \times \frac{r}{86400'' + r}$$

For expansion. $$\text{Correction} = + N \times \frac{1}{2} \times e\,(t - A)$$

For height used by Kater in 1818. $$\text{Correction} = + N \times \frac{h}{R}$$

For height used by Kater in 1819, by suggestion of Dr. Young. $$\text{Correction} = + N \times \frac{h}{R} \times x$$

For atmosphere, used by Kater in 1818. $$\text{Correction} = + N \times \frac{1}{2\left(\frac{G}{g} - 1\right)} \times \frac{B'}{B} \times \frac{1}{1 + .002083\,(t' - t)} \times \frac{1}{1 \times .0001\,(T' - t)}$$

For atmosphere, used by Baily in 1832, from investigations of Gauss, Airy, and others.

$$\text{Correction} = + \mathrm{N} \times \frac{1}{2\left(\frac{\mathrm{S}}{g} - 1\right)} \times \frac{\mathrm{B}'}{\mathrm{B}} \times \frac{1}{1 + u(\mathrm{T}' - t)} \times \frac{1}{1 + d(t' - t)}$$

For atmosphere, used by Baily in 1832, determined by experiment with vacuum apparatus.

$$\text{Correction} = + \mathrm{C}' \times \frac{\mathrm{B}'}{1 + .0023} \times (t' - 32^\circ)$$

Explanation of the foregoing notation.

N	= the number of vibrations in 24 mean solar hours as shown by clock.	
N′	= N + the corrections for arc, rate, and expansion.	
N″	= Number of vibrations in rarified medium, corrected for arc, rate, and expansion.	
A	= Semi-arc of vibration at commencement.	
a	= Semi-arc of vibration at end.	
M = 2.302585093	= Logarithmic modulus.	
r	= Rate of the clock: *minus* if losing.	
B	= Height of the barom.	assumed as standards for specific gravity.
t	= Temp. (Fahr.) of air.	
A = 62° (Fahr.)	= Temperature (Fahr.) of the air assumed as standard for pendulum.	
B′	= Height of the barometer.	Pendulum swung in full pressure.
t'	= Temp. (Fahr.) of the air.	
T′	= Temp. (Fahr.) of the mercury.	
B″	= Height of the Barom.	Pend. swung in highly rarified medium.
t''	= Temp. (Fahr.) of air.	
G	= Specific gravity of pend.	Compared with water considered as unity.
g = { $\frac{1}{836}$ for B, 29.27 and t, 53° Shuckburg; or $\frac{1}{770}$ for B, 29.928 and t, 32° Arago and Biot. }	= Specific gravity of air.	
S	= Vibrating specific gravity of the pendulum.	
s', s'', s'''	= Specific gravity of each body of pendulum, determined in usual manner.	
d', d'', d'''	= distance of each body of pendulum from point of suspension.	
w', w'', w'''	= Weight in air of each body of the pendulum.	
h	= Height of the place above the level of the sea.	
R	= Radius of the earth at the latitude of the place.	
x { from .50 to .75 Young. }	= a quantity determined from theory.	
u = .0001 inch.	= expansion of mercury for 1° Fahrenheit.	

d $\left\{\begin{matrix}\frac{1}{420} = .0023 \text{ of bulk} \\ \text{with moisture.}\end{matrix}\right\}$ Expansion of air for 1° Fahrenheit.

$$S = \frac{w'd' + w''d'' + w'''d''' + \&c.}{\frac{w'd'}{s'} + \frac{w''d''}{s''} + \frac{w'''d'''}{s'''} + \&c.}$$

e = Tabular expansion for 1° Fahr. of metal of pendulum.

$$t^{\circ} = \tfrac{1}{2}(t' - t'')$$

$$C' = \frac{N'' - N'}{B' - B''} \times [1 + .0023\,(t^{\circ} - 32^{\circ})]$$

The above formulæ in the present state of science, are considered as nearly perfect as possible; by them the length of the comparable seconds pendulum may be deduced from the observed seconds pendulum. The correction for height used by Sabine in 1830, was, at London,

$$x = 65.755 \text{ for comp. } \tfrac{1}{180}$$
$$x = 67.344 \text{ ” ” } \tfrac{1}{190}$$
$$x = 68.828 \text{ ” ” } \tfrac{1}{200}$$

The correction for temperature used by Sabine at Paris and London, was — 0.421 vibration for + 1° Fahrenheit. The expansion of platinum has been given above, that of brass, is as follows:—

Expansion of brass for 1° Fah. =	0.0000995456	Dulong and Petit.
” ”	0.0000098888	Borda.
” ”	0.0000099590	Kater.
brass scale	0.0000103077	Roy.
” cast	0.0000104166	Smeaton.
” bar	0.0000104850	Hassler.
” wire	0.0000107407	Smeaton.
” rod	0.0000105155	Roy.
Apparent cubical expansion of mercury for 1° Fah. - - =	0.0000857339	Baily.
Absolute - -	0.0001001001	”
Air dry, -	0.0020833333	”
Air moist -	0.0022222222	”

The pendulum can never be swung in a perfect vacuum, nor can friction at the point of suspension be completely obviated. The number of vibrations must therefore be corrected for these retarding forces. Moreover, since the temperature is seldom uniform at 62° during the observation, this must also be considered in making these corrections. Again, the momentum of the pendulum round its axis of suspension, and, consequently, its ability to overcome these varying resistances, depend upon the specific gravity of the pendulum.

Vibrating specific gravity.

But the momentum of the pendulum round its axis depends upon the distance of its parts from the axis of suspension, by which, in overcoming resistance, gravity acts at a longer or shorter arm of the lever. This compound effect is called its vibrating specific gravity. The absolute specific gravity of a pendulum may be measured with any degree of precision desired.

It is probable that no two observers would agree concerning the vibrating specific gravity. A small quantity of air is dragged with the pendulum, changing its vibrating specific gravity. This moving, or vibrating, quantity of air is resisted by the air through which it swings. It is extremely difficult to estimate the shape, or vibrating specific gravity, of this pneumatic metallic pendulum. If even this difficulty were obviated, another source of error would remain. The specific gravity of the air is variously estimated by different observers of high authority, Shuckburgh, and Biot and Arago. Kater's convertible pendulum dragged 8.339 grains of air with it; this was not allowed for in his estimate of the length of the seconds pendulum for the "imperial standard," and is therefore a source of error in that estimate. Mr. Baily, in 1830, found that by turning the knife edge A of Kater's convertible pendulum through 180° of azimuth, he caused a variation per day of 3.135 vibrations.

Air dragged with pendulum.

Kater's pendulum.

The same process with B,	0.939	"
Again, on another plane, A,	0.135	"
" " B,	1.928	"

Indicating another source of error in Kater's determination.

Captain Sabine, in 1829, compared the vibrations of Kater's pendulum at Browne's House, London, with those of the same at Greenwich, and found at Greenwich a retardation of 0.3 vibrations, instead of a calculated acceleration of 0.52 vibrations, making a discrepancy of 0.72 vibrations. This, however, only causes a variation of 0.00069 inch in the length of the seconds pendulum.

In 1828, Capt. Sabine determined the acceleration between Paris and London to be 12.05 vibrations. But Kater's London, and Biot's Paris pendulum for seconds differ 0.01065 inch, corresponding to an acceleration 11.5 vib's. Thus the difference 0.55 gives a discrepancy of 0.00023 in the length of the seconds pendulum; applying this to Biot's pendulum, 39.12843 in. — 0.00023 in. = 39.12820 in. which is a mean between Biot's and Borda's determinations, being 0.1 vib. nearer to Biot's than to Borda's.

Comparison of Kater's, Biot's, and Borda's estimates.

Capt. Sabine, in 1830, having constructed a pendulum more nearly symmetrical in shape, and having reduced its length to the conventional standards by the latest formulæ, and constants for reduction, reports the length of the seconds pendulum to be, at Greenwich, 39.13734 inches, differing from Kater's determination by — 0.002.

Discrepancies between Kater and Sabine.

This discrepancy is calculated to cause some doubt concerning the determinations of both.

In a paper in the London Philosophical Transactions, 1832, Baily has shown that the factor $n = \frac{C'}{C}$, (see formula above,) is not the same for the two edges A and B of Kater's, nor for the two edges of Sabine's supposed convertible pendulums. This accounts for a part of the discrepancy; for the remainder—we may account by attributing it

to an oversight in Sabine's observations, in other respects pretty accurate.

Capt. Sabine omitted to make the same number of coincidences with each knife edge; in this the source of error probably consists. In his pendulum, the centre of gravity is 26.23 inches from A, and 13.21 inches from B. Hence $\frac{26.23 \text{ in.}}{13.21} = 1.985 =$ factor by which any alteration in the results from knife edge A must be multiplied, in order to obtain corresponding alterations in those from B, and

$\frac{13.21 \text{ in.}}{26.23 - 3.21} = 1.015 =$ the factor for affecting A from change in B.

Thus for a removal of the slide, using different factors, we deduce for vibrations per day,

86067.72
86068.46
86069.06

Probable cause of error in Sabine's estimate.

If either of these results were deduced from an equal number of trials of each knife edge, it would be adopted as correct: but as Sabine made 188 trials with A, and 54 with B, his results are liable to similar discrepancies, and his variation from Kater's result is probably in part owing to this omission.

S. C. Walker.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN AUGUST, 1833.

With Remarks and Exemplifications, by the Editor.

1. For an improved *Protractor,* denominated the "Facilitating Protractor;" Elisha Brown, Tiffin, Seneca county, Ohio, August 1.

The paper upon which plotting is to be done, is fixed upon a square drawing board, or plane table, in the usual manner. The rule by which the lines are to be drawn, is divided so as to form a scale of equal parts; and to adapt it to laying down lines at any required angle, by means of a pin on which it works, it is affixed to a straight piece which is to slide against the sides of the drawing board, like the head of a T square. Upon the outer edge of this piece there is a protractor, divided in the usual way; the pin upon which the rule works being in its centre, and the end of the rule extended out so as to form an index and vernier, which points out the angles.

There is no claim made, but we are informed that "this instrument is intended to supersede the use of all other instruments in plotting, with the exception of a pin, a pencil, or pen, and the dividers in dividing circles."

We have seen many instruments the same as this in principle, and some that offer advantages which this does not present. The fact is, that the utility of something of the kind is so obvious, that no doubt the thoughts of hundreds of different individuals have been directed

to the subject. We have prevented the obtaining of more than one patent for such an instrument by advising the applicant that the affair was not new. One edition of "Adams' Geometrical and Graphical Essay," is that of 1791, and the second plate in it represents a protracting parallel rule, which affords all, and more than all, the facilities which that above described is said to present.

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2. For a *Rotary Machine;* Elisha Hall, Hyde Park, Dutchess county, New York, August 3.

This, the patentee informs us, is a patent for improvements on the *rotary machine*, for which he obtained a patent on the 20th day of May, 1825. The instrument is, in fact, a rotary pump, or engine, for raising and forcing water; in its construction it resembles many other rotary engines, having two valves which are to revolve in an annular chamber furnished with supply and discharge tubes. Although in principle it is identical with several preceding attempts, there are in it several contrivances, or appendages, which have some novelty in them; but these do not appear to be of a character likely, in any degree, to remove the main objections to such pumps.

After giving the particulars of his arrangement, the patentee claims "the before described combination or arrangement of the several parts of the pump, and requisite fixtures for to be attached to the same." After this, there are thirteen *particular* points claimed, some of which are new, some old, and some trifling. We cannot give them all, but will furnish a sample. In the pump, as formerly patented, there were three rotary valves, and two only are now used; and the "using two rotary valves in the wheel and channel of the pump, in the place of three," forms one of the claims. Now we could point out twenty patented rotary pumps, with two valves only. *Globular valves* are also claimed, which consist of round balls fitting into hollow valve seats, the curvature of which is adapted to them; these are old enough. A label is to be stamped upon the pump with a die in a circular form, and this makes the last of the claims!

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3. For a *Boot Cramper;* Dimon B. Barnum, New Fairfield, Fairfield county, Connecticut, August 5.

The patentee has, most likely, a clear conception of the construction and use of his cramping machine, although he has not succeeded in furnishing a very exact description of it; with the aid of the drawing, however, it may be pretty well understood. The leather to be cramped is placed upon the edge of a half inch board, notched into proper form, and held in a suitable frame; a follower is then brought down, having, upon its lower side, two jaws which embrace the leather and the half inch board: this is to be pressed down upon the leather by means of a lever, four feet long, and having its fulcrum at one end, and about six inches beyond the cramping board. The corners of the leather, below the jaws, are to be caught and extended by a contrivance fixed for that purpose. No claim is made to any part

of the machine, and there is very little difference between it and some others in the patent office.

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4. For a plan for *Marking off and Cutting Garments*, called "Beard's Graduated Patent Rule;" George Beard, jr., Whiteland, Chester county, Pennsylvania, August 5.

A small sized garment is to be marked on the middle of a piece of paper, and a large sized one at its extremities. The intermediate space is to be occupied by the requisite number of intermediate sizes. The pattern is to be perforated with "orifices or incisures," made through at each pattern, so that it can be laid on the cloth, and marked through, for a garment of any size. We are informed also that "the component parts of a garment may be put separately on separate pieces of paper, when most convenient" "The plan of graduating sizes on a pattern, as well as the adaptation of such patterns to marking off, and cutting out, coats, vests, and pantaloons, and all other garments and parts of clothing, is claimed as this invention."

We suppose, that, hereafter, the women must call with their patterns, upon the patentee, and have them stamped, in due form; not for coats, vests, and *pantaloons* only, but for *all other garments*.

The patentee must, we imagine, have made the notable discovery that not only men and women, but men and boys, are all made to one scale, in length, breadth, and thickness; a thing which had never before been dreamed of, and which, if correct, must lead to very important results. We see no reason, if this be the fact, why by sending to the taylor the exact length of the leg, or of any other member, we may not, without further trouble, have a suit of clothes made with mathematical precision.

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5. For a *Washing Machine;* George W. Wilson, Dunstable, Hillsborough county, New Hampshire, August 7.

This washing machine is to produce its effect principally by the action of two hammers, or beaters, made like those of a common fulling mill, which as they play in a trough by a crank motion, squeeze the clothes against a breast work of fluted rollers. The size and arrangement of the respective parts are given with the utmost precision, under twenty different heads. The claim is to "the arrangement and putting together of the various parts as specified, and the application thereof, and of the powers and principles embraced in the construction of the machine and its operation, (in the manner above set forth,) for the purpose of washing clothes, the said powers being the crank and tread powers *regulated by the balance wheel.*"

In this claim we think that there is a little too much amplification, as all that can by any possibility be accounted new in the machine, is the particular arrangement of its respective parts. The application of the crank and tread powers, *regulated by the balance wheel*, appears to be considered as something special, but why it should is difficult to tell, as they are very generally applied to machinery.

6. For a *Machine for Shelling Corn;* Michael Carpenter, city of Lancaster, Pennsylvania, August 8.

This patent is obtained for improvements upon the shelling machine patented by the same person, on the 25th of October, 1832. The general construction of the machine is the same with that formerly described, but in the particular form given to the parts it is undoubtedly improved. The specification also, sets forth more clearly, and claims more distinctly, the things intended to be patented; we cannot, however, follow the patentee through his description, as the aid of the drawing could not be very well dispensed with in any such attempt. So far as we can judge by the evidence before us, the machine appears to be well calculated to answer the purpose intended.

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7. For a *Straw Cutter;* Benjamin R. Green, Warwick, Kent county, Rhode Island, August 8.

The claim made by the patentee will afford a tolerably correct idea of the mode in which this straw cutter acts; it is in the following words:—

"What I claim as new, and as my own invention in the above described machine, and for the use of which I ask an exclusive privilege, is the construction of a machine for cutting or chopping straw, or hay, for cattle and horses, having knives, inserted in, or fastened to, the circumference of a cylinder revolving on its own axis; the cutting edges of said knives coming in contact with the circumference of another cylinder, of lead, or other soft metal, revolving on its own axis, cuts or severs the substance passing between them; the surfaces of these cylinders being held in contact by slide boxes and screws, and drawn together by the same means, when worn away by use."

The cutting cylinder, with its knives, is placed above a cylinder covered with lead, and the straw is fed between them by means of a trough. The cutting cylinder has rims projecting out at each end to receive the knives which extend from one to the other. The number of knives must be governed by the size of the machine, as must also the velocity of the motion. The cylinder covered with lead may be moved with the same, or with greater or less velocity, than that of the cutting cylinder, the main object of its motion being constantly to vary the part upon which the knives shall act.

The specification is clearly drawn up, and we think conforms in all respects with the requirements of the law.

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8. For an improvement in the *Manufacture of Axes and other edge tools;* Joseph P. Hazard, South Kingston, Washington county, Rhode Island, August 9.

We have been requested by the patentee to postpone our notice of this patent for a short period; we shall, however, hereafter, publish the specification, or make such observations respecting it as may appear proper. We generally delay our notices for about six months, excepting in those cases where inventors desire an earlier insertion of their inventions, wherever a good reason is furnished for further

delay, as in the present instance, we unhesitatingly comply with the request, but not otherwise, our duties as public journalists will not admit of more than this. A patent is granted by the public, and they have a right to know for what, or no judgment can be formed of the validity of the claims of those who declare that they have invented something which is both "new and useful."

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9. For a *Rail-way for Raising Vessels for repair;* Thomas R. Gedney, city of Washington, District of Columbia, August 9.

We are entirely at a loss to tell for what this patent is taken; the patentee, however, in his claim, says that "the improvement or invention consists in simplifying the operations now resorted to, either at a very great expense, or with complicated machinery, in order to the attainment of the object heretofore referred to; a simple set of rails being introduced, and made to answer the purpose instead of a double set of ways," &c. &c.

The first efficient marine rail-way, was that patented by Moreton, in Scotland, one of which is erected and is in use in Philadelphia; and there are several others in the United States, of a very similar construction, but having certain improvements in them for which patents have been obtained; they are not, it is true, quite so simple as that represented in the drawing accompanying this specification, although they do not differ from it excepting in having those appendages without which the machine sketched by the patentee, would be of no utility. It may be most confidently asserted, that should any one attempt to build a marine rail-way by the information afforded by this specification, and the drawings which accompany it, he would fail most completely; the defect of the specification not being the absence of novelty merely, but a total want of completeness in matters of detail.

The drawing is essentially defective, being without the written references required by law.

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10. For an *Animal Trap;* Henry Adams, Erie county, Pennsylvania, August 10.

This trap resembles some of those for catching rats, having a fall which descends, when the animal enters it for the purpose of taking the food placed on a platform at its centre. There are, it appears, some points of arrangement in which it differs from those commonly made, but they are not pointed out, nor is any thing claimed.

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11. For an improvement in the *Mode of Manufacturing Tobacco;* for which two patents have been previously issued to the applicants; the first dated April 3, 1827, and the other December 6, 1831, which two patents have been surrendered, and a new one issued on an amended specification. John Allen, jr., and Charles Geoghegan, Richmond, Virginia, August 10.

By the two last of these patents it would appear that the patentees are aliens, who have resided upwards of two years in the United

States; the first specification, however, was issued to them as citizens; this, no doubt, occurred by an oversight, somewhere, and probably may be considered as corrected by the surrender of this specification. The patent obtained in December, 1831, was for precisely the same thing as the first, but the specification entered more extensively into particulars than the former, without, however, stating, with sufficient distinctness, what were the points claimed. Both these patents have now been surrendered, and one issued in their place for the unexpired part of the fourteen years, dating from the first patent. This was the only correct mode of procedure, as the second patent was invalid from its very nature, a similar one having been previously obtained by the same persons.

The specification upon which the present patent is taken is in nearly the same words with that of December, 1831, which, however, had no claim; whilst this ends with the following claim:—

"Now what we particularly claim as our invention, and which we wish to secure by letters patent, is the before described mode of cutting the tobacco, after being rolled, spun, wound, or laid, on boards, and flattened; and though we specify fully the manner in which the entire operation is performed, we wish it to be distinctly understood, that we make no claim to the mode of rolling, spinning, laying, or flattening the tobacco."

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12. For *Manufacturing Paper, for the Walls of Houses;* James P. Howland and Alfred Griswold, Muncey, Lycoming county, Pennsylvania, August 10.

Although it is no uncommon thing to take patents for what has been known and practised for many years, and sometimes for ages, we are still surprised whenever it occurs, especially in those cases where the thing patented has been one of much notoriety, as in the instance before us.

Fifty years ago, what was called flocked paper, for papering rooms, had become an old invention; it, however, has never gone entirely out of fashion, for when well made, as in many of the beautiful patterns imported from France, the effect produced by it is unique. It is for this application of woollen flocks to paper that the patent is obtained, by which these remarks are elicited, as will be seen by the following claim.

"The undersigned claim as their peculiar joint invention, the use of the shearings, or flocks of cloth, taken from the same in the manufacture thereof, for the purpose of covering the surfaces of paper, muslin, linen, leather, and wood, for useful and ornamental purposes. They claim further the invention of applying the same by a sieve, in any manner that the same may be used, and of preparing the paper, or other matter to be covered, by a strong, adhesive sizing, as above stated, and of fixing the shearings, or flocks, by pressure.

13. For an improvement in *Millstones, for manufacturing grain into flour;* Jacob B. Minick, Manlius, Onondagua county, New York, August 10.

The improvements are stated to consist in a new method of dressing the mill stones; and in a mode of cooling the flour as fast as it is ground, by forcing air between the stones whilst in operation.

We are told that in dressing the stones an additional furrow is to be cut in each land, or from two to twenty on each mill stone; all the furrows are, also, to be cut much deeper than usual, especially towards the eye of the stone, where they may be from three-quarters to an inch and a half deep; they are to extend about two-thirds of the way from the eye to the periphery, and are to cross the ordinary furrows.

The cooling is to be effected by means of a cylinder fixed to the eye of the stone, its length being about equal to the thickness of the stone, and is to revolve with it; on its inside, vanes are to be fixed, bending spirally, so as to force the wind down between the stones, and along the furrows.

There is a drawing intended to exhibit the manner of dressing the stones; but of the cylinder, with its vanes, there are no drawings, leaving the patent materially defective in this particular; for an illustration of this part, the model being referred to.

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14. For a mode of *Curing Asiatic or Spasmodic Cholera;* Anthony Hunn, senr., M. D., Lancaster, Garrard county, Kentucky, August 12.

As soon as the symptoms appear, blisters are to be applied to the pit of the stomach, the crown of the head, on the arms above the wrists, and on the outside of each ankle.

Thirty drops of the following tincture are to be administered every hour.

Paragoric elixir and sulphuric ether are to be mixed in equal parts, and to every thirty drops or half drachm of this mixture, two drops of cajeput oil, and two of oil of anniseed are to be added.

After every discharge inject gr. ij, opii, in half a tea-cupful of warm water.

We presume that preparatory to using the recipe it will be proper to send to Kentucky for a right.

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15. For a *Machine for Setting Saws;* William Hinds, Otsego, Otsego county, New York, August 12.

We shall not undertake to describe the particular form given to this saw set, as it could not be well done without a drawing. The patentee says that he invented it in all its parts, but that he has been since informed that a patent for one very similar to it was obtained in the year 1812, by John Summers, of Pennsylvania; in which case he means only to claim his as an improvement. This does not appear to fulfil the demands of the law, that the inventor should tell in what

his improvement consists; a point which he ought definitely to have ascertained before claiming a patent.

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16. For a *Frieze Window;* William Woolley, city of New York, August 13.

The patentee states that he some years since invented the frieze window, as a substitute for the dormar window, and that it has gone into extensive use in many of the best houses in New York. It receives its name from being inserted in the frieze, under the cornice, and the present patent is taken for an improvement in the mode of fitting up, or finishing, such windows.

For a house of ordinary size, the opening in the frieze may be three feet six inches in length, by twenty-two inches in height. This is to be covered with an ornamental fret work, which may be made of cast iron; and this, when painted white, will appear like an ornament to the frieze, whilst it will admit sufficient light through the frets, and conceal the sash behind it.

"The above described blind, cast from iron or other material, and so constructed as to admit sufficient light and air, while it hides or shades the window, and forms an elegant ornament in the frieze of the cornice, I claim as my invention and improvement."

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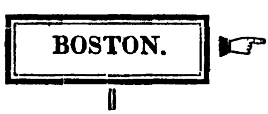
17. For a *Traveller's Night and Day Director;* Robert Charles Manners, city of Boston, Massachusetts, August 13.

A frame is to be made of any suitable material, cast iron being preferred, which frame is to contain the name, or direction, to any particular place in solid letters with an open ground. The letters may be cast in one piece with the frame, or attached to it in any convenient way; it is then to be fixed upon a finger or direction post, in the usual way. Its appearance will be that of the mark in the margin, supposing the white parts to be removed. A word of this description may, it is said, be read with facility on either side, will be visible in the night, excepting in cases of unusual darkness, and may even then, if necessary, be read with the fingers.



It is proposed to form the names of streets, &c., in the same way, in which case lamp posts may serve not only for their ordinary purpose, but to sustain the name in such a situation as shall admit of its being illuminated.

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18. For a process for *Purifying Cotton Seed Oil;* John J. Gerard, city of New York, August 14.

Sixteen pounds of quick lime are to be slacked by pouring upon it eight gallons of boiling water. Twelve pounds of common potash (sub carbonate,) are then to be gradually mixed with the lime and water. The liquid is to be kept in vessels closely stopped, and when wanted for use, half a gill of the solution is to be added to each gallon of oil, and the mixture churned for five or ten minutes. After

this it is to be put into vats, in which the heat of steam can be applied to it, which will precipitate the glutinous matter to the bottom. The oil so clarified is to be used for burning, painting, dressing woollens, &c.

We could cite many instances of the employment of caustic potash for the purification of oil, and among them two previous patents from New York. We have turned to the date of one of these, which is June 13th, 1831, and a notice of it, will be found at p. 333, vol. viii. sperm and whale oils are those named by the patentee, John L. Embree; and it may be imagined that cotton seed oil, if purified in the same way, will furnish a foundation upon which to sustain a new patent; we, however, apprehend that such is not the fact.

We have essayed well purified cotton seed oil for burning in lamps, but have not found it to afford the brilliant light of sperm, nor do we believe that any of the vegetable oils are comparable to it in this respect, although they are applicable to many other useful purposes, and to some of them better suited than any of the animal oils.

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19. For a chisel, called the *Cutting and Cleaning Chisel;* George Page, Keene, Cheshire county, New Hampshire, August 14.

This chisel is intended, principally, to be used with mortising machines, but may be employed for trimming mortises made by hand. It is not very clearly described, although we believe that we understand its construction. A drawing accompanies the specification, but it is without "written references."

The main cutting part of the chisel is to be in the ordinary form, but it is to have a second cutting edge, or chisel, in front, and about three sixteenths of an inch in advance of it. These two parts are to be joined together by two sides, with cutting edges, so that the four sides form it into a quadrangular socket or box. The main cutting side, and the two side pieces are bevelled inwards, the other outwards. In hard stuff, a hole is to be bored, the diameter of which is equal to the width of the main chisel. In mortising, a chip of about one-eighth of an inch is to be cut, advancing towards each end of the mortise, which chips will be forced up, one before the other, through the socket.

Chisels with three sides have, we believe, been used in mortising machines, and the claim in the present case is to "the addition of a fourth edge; or in other words, that side of the box before described, which is opposite to the main part of the chisel, and serves as a support to the side edges."

The main objection to a chisel of this description is the extreme difficulty of keeping it in order, a difficulty which the practical workman will readily perceive; but for this it would undoubtedly operate well. It should have been observed, that the cutting edge of the added side, is above that of the main cutting chisel, and that the side cutters, of course, slope up to it, the whole face forming an inclined plane.

20. For a *Coffee Mill;* Ammi Clark, Berlin, Hartford county, Connecticut, August 14.

This patent is for an improvement on the double mill for which a patent was obtained by Mr. Clark, at a former period. The double mill has flutes, or teeth, on both sides of the runner, and the improvement now patented consists in the manner in which what is called the circular flute, and the guard rim, are formed: the claim is in the following words—

"I claim herein as my invention or improvement, the following things merely; to wit, the carrying of the circular flute and the guard rim, through, or across, the hopper; and the application to mills for grinding coffee, and other substances, of the flanch on the runner, separated into segments at convenient distances from each other."

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21. For a *Stove for burning Anthracite,* denominated the "Combination Stove;" James Atwater, New Haven, New Haven county, Connecticut, August 23.

The objects which the patentee proposes to accomplish by means of this stove, he states to be, 1st, to be able to regulate the draft, and to direct it upwards, downwards, or horizontally. 2nd. The ability of employing a small quantity of coal, and to continue its combustion longer than usual. 3d. To economise heat by turning the draft through pipes, after the combustion has advanced, so as to diffuse it through the apartment. 4th, to clear the stove of ashes, without allowing it to escape into the room.

This stove is too complex to allow of our attempting to give a clear idea of its various parts, to represent which, and the different modes of constructing it, the specification is accompanied by nine figures.

The claims made are to the combination and arrangement of the several parts so adapted to each other as to accomplish the four purposes above proposed. The separate parts so combined, are said to be, 1st, a stove or furnace, either cylindrical or prismatic, having one or more openings in its back, furnished with valves, to open or close as required. 2nd, a chamber in the rear for air and dust, into which the flues open, and having outlets for heated air and smoke, and furnished also with doors below the grate, for the purpose of removing dust, ventilating the room, and regulating the draft. 3d, pipes connected with the air chamber, and intended to diffuse heat through the room. 4th, one or more valves, slides, or stoppers, to regulate the draft through the pipes. This enumeration is closed by a statement that the patentee does "not claim any of the separate parts separately taken, or any particular portions of the separate parts, but the combination and arrangement of all the parts, whether new or old, to form a whole compound instrument, as aforesaid."

A claim of this description seems to require that the parts so combined should present an instrument distinctly characterized by their combination, and we have no doubt that such is the case with the stove before us in the estimation of the patentee; we, however, might be at a loss to tell in what particulars his rights would be violated, were

any one to construct a stove varying in form from those given in the drawings; we presume, however, that the patentee will meet with numerous instances in which he will think that they are invaded.

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22. For an improvement in *Stoves, Grates, or Furnaces;* James Atwater, New Haven, New Haven county, Connecticut, August 23.

We are told that this improvement consists in adding a chamber to a stove grate, or furnace, which chamber is to have outlets at, or near, the top, and also near the bottom, for smoke, air, and dust. This chamber is to be made capable of being divided into an upper and lower section, in such a way that the smoke, &c. may be conveyed through one or more openings in the back of the stove, &c., and be conducted off, either upwards through the ordinary smoke pipe, or down through the chamber and the lower openings. Valves are to be used to regulate the openings through the back. There is to be a wide slider, or stopper, for the purpose of dividing the chamber into two parts, which must be closely fitted and slide on proper ledges.

The claim is to "the addition to a stove, grate, or furnace, of a chamber for heated air, smoke and dust, divided into an upper and a lower section by a movable slide, valve, or stopper; which chamber has an outlet at or near the top, and one or more outlets at or near the bottom, all fitted to receive pipe; and which chamber has also one or more openings below the fire, and as near as may be to the bottom of the chamber, which latter openings are regulated by means of doors, slides, or stoppers, so as to be opened or shut at pleasure.

"I claim no part of the whole instrument described or exhibited in the drawings, as my invention, except the chamber with its appendages as above described."

Although sufficient pains appear to have been taken both with this and the preceding description, to make the things claimed clear and intelligible, we confess that in these, as well as in Mr. Atwater's former patents for improvements in stoves, we have not been able distinctly to perceive the nature and object of his arrangements, and are not, therefore in a condition either to applaud them or to point out what in them we might deem defects.

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23. For an improvement in the *Plough;* Charles B. Taylor, Bainbridge, Ross county, Ohio, August 23.

After giving lengths, breadths, and thicknesses for the mouldboard and landside, and telling how a cast steel share and coulter are to be bolted on to the aforesaid cast iron mouldboard, the patentee claims as his invention "the cast iron share, or first share, cast solid, or in one piece; the steel plate on the landside, the second share being of steel, and split, and made so as to fit on a shoulder on the mouldboard, and over the second share on top, and project an inch and a half on the underside, being welded fast to the coulter at the point, fastened by two screw-bolts to the mouldboard; the coulter of steel or iron split, and extending three inches on the mouldboard, two and

a half on the landside, fastened by two screw bolts, the mouldboard being of the form of the Cary or bull plough."

24. For *Elastic Seat Saddles;* Bushrod Smith, Romney, New Hampshire county, Virginia, August 24.

The elasticity of this saddle is to be derived from a steel spring which is to be wound spirally round a staple formed of bar iron, the two sides of which are far enough apart for the spring, by its coils, to form a seat.

A spring of this description, long enough to coil round the iron bar, and form a seat, must, we should suppose, when uncoiled extend fifteen or sixteen feet, and it is no simple task to make "a well tempered spring" of this description; besides which they are very liable to break, even when made by the best workmen; we should suppose that a stout elastic webbing wound round in the way proposed for the steel spring, would not be less costly, merely; but more pleasant, less apt to break, and more readily repaired.

25. For a *Plough;* Elisha Kelly, Bainbridge, Ross county, Ohio, August 26.

The handles of this plough are to be of wood, and certain other portions of it are to be of iron; particular dimensions for the various parts are furnished by the patentee, as also the necessary directions for attaching the mouldboard to the beam and handles. The claim made is to a rod of iron by which the handle is attached to the mouldboard; and a piece of sheet iron which extends "from the top of the landside under the wing, and attached to the handle by means of a screw."

Let the makers and users of ploughs look well to the iron rods, and the pins of sheet iron about them, to see that they are not placed as, and where, the claimant places them, in those of his construction.

26. For a *Machine for Planeing, Tongueing and Grooving Boards;* James Mac Gregor, jr., Wilton, Saratoga county, New York, August 28.

The planeing part of this machine operates in the same way with the well known English planeing machine invented many years since by Mr. Brama. That is, a wheel fixed to a vertical shaft is made to revolve horizontally, the lower side of this wheel forming the face of the plane. The latter part, the patentee says, is to be made of cast iron, and turned true. In it there are to be sixteen slots, which are to receive the plane irons, and to form the throats of the planes; the irons are to be fixed in their places by means of screws. The edges of the plane irons are to be turned up so as to cause them to operate, in that part, like a turning gouge, whilst the middle part is straight. The board to be planed must, of course, pass on one side of the vertical shaft, and is *traversed* by the planes. The ends of the shaft work in boxes which can be raised and lowered to adapt the planes to the thickness of the stuff to be planed.

The board is to be carried forward by an endless chain furnished with hooks for that purpose, whilst it rests on ways extending in both directions from the planeing wheel.

The jointing is performed by two circular saws, one of which is on an adjustable frame, to adapt it to the desired width of the stuff. This jointing is the first operation effected by the machine, and to this succeeds the tongueing and grooving, which, also, is done by circular saws. For tongueing there are two circular saws on a horizontal shaft, standing at such distance apart as is required for the thickness of the tongue, and two other saws, which are placed with their shafts at right angles to these, one of them to cut above and the other below the board, into the kerfs formed on the edge, and thus to complete the tongue. The grooving is performed by three circular saws, two of which cut the width of the groove, being fixed on the same shaft, like the first two for tongueing; the third, which is on a separate shaft, must be thick enough to take out the middle piece left by the other two. From the grooving saws the board passes under the planes, where it is finished.

We cannot follow the description through all its details, and must omit some which are referred to in the claims. The mode of planeing by a horizontal wheel, and some other things which have been previously done in a similar way, such, for example, as keeping the board down by rollers and weights, are not claimed; those which are so, being "the planeing of timber of any size or dimensions by the principle of the turning tool and plane iron united, as described; or the turning tool separate from the plane iron, or so near as to retain the same principle. The application of the sliding box for the step of the revolving plane shaft to turn in, and by which the revolving plane is raised and lowered to give the desired thickness to the plank. The making the shaft through beyond the face of the revolving circular plane, so as to have a step for the plane to rest on.—The application of the gauge under the plane to keep the shaft down while the plane is operating.—The application of the common circular saws to joint, tongue and groove plank, in the manner before described.—The mode of forming a tongue on a board, by cutting in the edge of the plank horizontally, on each side of the tongue, and then vertically, to form the shoulders by circular saws.—The mode of forming the groove by making two horizontal cuts in the edge of the plank with two circular saws, and cleaning out the timber between these cuts by a circular saw."

The jointing by circular saws has been frequently done, and we do not perceive any essential difference in the mode proposed from that which has been previously adopted. In Woodworth's planeing machine, the grooving is effected by a single circular cutter, operating very much like the third circular saw in the present case; to us the principle appears to be the same, and the three saws no improvement.

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27. For a *Saw for Sawing Staves and other Cylindrical Work;* Sumner King, Chittenango, Madison county, New York, August 29.

The saw in this case is to be a complete hoop, with teeth upon one of its edges. Its diameter must, of course, depend upon the curvature required in the stuff to be cut. The inside of the saw rests against friction rollers, placed in a circle, at equal distances apart, excepting at the point where the cutting is to be effected, a space being left there, equal in width to that of the stuff to be cut. A band is to be placed around the saw, and over a drum by which it is to be turned, and this band is made to embrace the saw around a large portion of its circumference by means of two friction pulleys, which, however, leave it free at the cutting part.

Tw oof the friction rollers are to have a cant, to incline the saw to keep back on its bearing, which is against friction rollers. The claim is to a sawing machine so constructed.

We believe the plan to be new, but are apprehensive that the stiffness in the cutting part will not be sufficient to cause the saw to work well, without making it inconveniently thick.

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28. For an improvement on *Two wheeled Carriages;* Hazard Knowles, Colchester, New London county, Connecticut, August 29.

(See Specification.)

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29. For a *Truss for Hernia;* denominated the Elastic Concave Padded Truss, without stuffing, Horatio G. Jamison, Baltimore, Maryland, August 29.

The claim to improvement in this truss, is rested mainly on the employment of a concave formed pad, without the introduction into it of any articles in the form of stuffing.

The spring, instead of being a steel plate, is to be formed of a single piece of iron, brass, or steel wire, so bent as to assume the usual shape of the steel spring, and the outline of the pad; the wire is double, occupying each edge of the material with which it is to be covered; thus forming the spring strap, which goes round the body. The two wires are to be kept in their places, parallel to each other, by cleets of tin, or other metal. The wire spring is to be well lapped with woollen cloth, and the ring part which gives form to the pad is also to be brought to the proper thickness in the same way; strong tape is then to be plaited upon the woollen, thus producing an elastic concave pad. A covering of cloth, velvet, or leather, is to be drawn over the whole, and the necessary strap for confining it in its place, sewed on.

The holes in the strap are to pass over a common button, attached to the middle of the pad, the eye passing through a piece of calf skin fastened on to the back of the pad for that purpose.

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30. For an improvement in the *Cotton Speeder;* Luman Parmelee, Poughkeepsie, Dutchess county, New York, August 29.

In this speeder, the condensation of the roping is to be effected by condensing pulleys of nine inches in diameter, covered with leather

on their peripheries. In a machine of ten spools, there will be eleven such pulleys, leaving ten spaces for the roping to pass between them. The axles of these pulleys have whirls on them, all turned by the same strap, which is borne up against them by friction rollers placed between each pair of whirls.

The spool guides are set at an angle of forty-five degrees, that the roping upon the spools, as they fill, may remain at the same distance from the guide, or hook, between the spools and condenser.

The claim is to "the twisting pulley, there being one to every thread, and an additional one to each frame of spools:—the guide which takes the thread or roping from the twisting pulley to the spool:—and the application of the pinion on the axles to drive the spool carriage."

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31. For an improvement in the *Temple for Weavers;* Cyrus T. K. Rollins, Lowell, Middlesex county, Massachusetts, August 30.

We cannot, without a drawing, give a good description of the construction of this temple; the claim made to it is, "the giving this kind of temple a motion in the breast beam, so as to accommodate itself to the motion of the cloth, and to prevent the injuring of the temple, the shuttle, or the cloth, in case of the shuttle being stopped between the reed and the temple."

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32. For a *Fuel Saving House Heater and Cooking Stove,* Josiah W. Kirk and Eli Kirk, city of Philadelphia, August 31.

The object of this improvement, we are told, is to perform cooking, and to heat air for diffusion through the house, by the same fuel. The stove is to be in part of brick and in part of plates of iron. A square wall is to built, three or four inches thick, leaving openings on one side for the grate, ash pit, and an oven. Within this first wall, a second is to be built on three sides, leaving a space between the two, for an heated air chamber. Into this openings are to be made to admit fresh air to be heated, and thence diffused over the house in any convenient way. The walls are all to be built to the same height, and a cast iron plate, with suitable openings for a smoke pipe, to receive boilers, and to discharge the heated air.

The claim made, is, to the combination by which the same fuel is employed for the process of cooking, and for heating air for diffusion in the house, the latter being kept from commingling with the former.

There is little of novelty in this combination, many analogous contrivances having been made; it seems to us, therefore, that the patentees must be confined to their own specified arrangement, as their stove does not possess any distinctive character, to point it out under any considerable change of form. No particular means are proposed for diffusing the heat from the air chamber, and we are very apprehensive that the patentees will find it less diffusible than they anticipate.

Specifications of American Patents.

Specification of a patent for applying spiral or other springs to gigs, and other two wheeled carriages. Granted to Hazard Knowles, *Colchester, New London county, Connecticut, August* 29, 1833.

To all whom it may concern, be it known, that I, Hazard Knowles, of Colchester, in the county of New London, and state of Connecticut, have invented a new and improved mode of applying spiral or other springs to gigs and other two wheeled carriages, by which the bodies of such carriages are allowed to advance forward when the wheels are suddenly checked by any obstruction in travelling, and the unpleasant and injurious effect resulting from the immediate stoppage of the momentum of such carriage, is in a great degree obviated, and the position of the load is so changed in ascending or descending hills as to be more favourable to the draft of the horse. And I do hereby declare that the following is a full and exact description of my said invention.

The spring which I use to prevent the direct arresting of the momentum of the body of the carriage is usually of the spiral kind, which I consider as best adapted to the purpose. This spring is contained within a clasp staple, or other appendage, as shown in No. 1 in the accompanying drawing, which represents the said spring and its clasp, &c. *a a* is a clasp or staple, attached to the draw bar *b b*, containing within it the spiral spring *c c*. The ends of this spiral spring bear against circular caps, with projecting rims to receive them. Through holes in these caps, and also in the draw bar, and in the head of the clasp, passes a slide, No. 2, and having in it a slot, *d d*, of a length equivalent to that of the spring *c c*: For gigs of an ordinary size, the spring may be from eight to nine inches in length, and three inches in diameter; and a slide of twenty-one or twenty-two inches in length will then bear a good proportion to the spring. It may be made round, or otherwise, about three-fourths of an inch in diameter, and the slot about two-tenths of an inch wide. The part *e* embraces the whiffle tree, and is secured to it by a bolt. When the slide passes through the centre of the spring, two keys, or pins, one on the outside of each cap, and having heads on their ends, pass through the slot, and acting on the spring through the medium of the caps, eases the motion of the vehicle in either direction.

The whiffletree, 3, has joints at the ends *f f*, to receive metallic or other rods, 3′, 3′, which may be two feet nine inches long, and must be of sufficient strength to hold back, as well as to draw the vehicle by the forward ends. These rods are bent at the forward ends *g g*, so as to hold the britching, and to hook the traces. The rods may pass either above or under the thills, and through loops of leather bolted to the thills, about four or five inches from the forward ends of the rods.

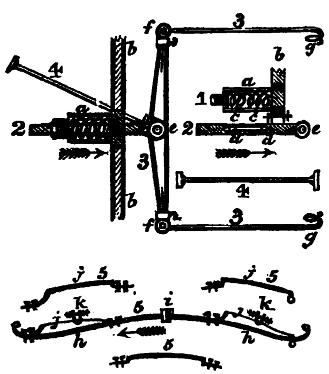
No. 4, is a rod of metal, or other material, extending from the

forked end *e* of the slide, to the under side of the body, Instead of connecting the ends of this bar to the body of the vehicle, and to the whiffletree by iron eyes, I usually employ a loop of leather, strengthened by doubling it: the bolt of the whiffletree passes through one of these loops, and another bolt is used to attach the other end to the body. The load is drawn by means of this rod.

Below the body of the vehicle, I place curved pieces of wood or metal *h h*, No. 5, which rest upon the thorough braces. In a gig which I have in use, these are three feet two inches in length, and in form resemble a cradle spring inverted; they are connected together by a cross bar fastened at *i*. Near their ends are ways of metal *j j*, about nine inches long, resembling in form the pieces *h h*, and firmly fastened to them. Eyes, or staples *k k*, secured to the under side of the carriage body, enable it to slide backward and forward upon the ways *j j*, which they embrace. There are many other methods in which this sliding part may be constructed, but the foregoing will serve as an exemplification of its mode or principle of action.

From the sliding motion of the carriage, the play of the tug strap may not always be sufficient to render the traversing perfectly free, to obviate which difficulty I make the tug staple, upon the thills, longer than usual; but they need not be lengthened in a degree equal to the required play, as the strap itself will answer the intended purpose to a considerable extent.

By the arrangement described, the horse and rider will not only be relieved from the effect of sudden obstructions on the road, but the bearing of the thills and the position of the body and load of two wheeled vehicles, when ascending or descending hills, will be so changed as to be favourable to the draft of the horse.



What I claim as my invention is the manner of employing a spiral or other spring, or springs, so combined with the sliding motion of the body of a two wheeled carriage as to produce the effects described, whether the separate parts be constructed exactly in the way hereinbefore set forth, or in any other operating upon the same principle, and producing the same effects.

HAZARD KNOWLES.

¶ ***Report of the Board of Examiners, appointed by the Connecticut River Steam Boat Company, to inquire into the causes of the Explosion of the Steam Boat New England, which occurred at Essex, October* 9*th*, 1833.**

(Concluded from p. 65.)

Testimony of Adam Hall, *Engineer.*

Witness is chief engineer of the establishment of the West Point Foundry association. Made the engine and boilers of the New England. The boilers were 8 feet 4 inches wide, 8 feet high, and about 15 feet long.* Each boiler had two arched flues, and five circular return flues, of 16 inches in diameter.

The arches were made of rolled copper No. 3, wire gauge. The outer shell of No. 4, and the circular flues of No. 5. The boilers were placed one on each guard of the steam boat, at the distance of about 25 feet from the engine. The boilers were strongly braced with $\frac{7}{8}$ inch bolts through the legs or flat sides, at the distance of nine inches, and the arches were secured to the upper parts of the boiler by long bolts of $\frac{3}{4}$ inch copper, with crow feet fastenings. The steam pipes were also of copper, 10 or $10\frac{1}{4}$ inches in diameter, and the safety valve was of the diameter of $10\frac{1}{2}$ inches. The latter was calculated to blow off at a pressure of 20 inches, but the lever was afterwards shortened about 2 feet, and new weights added, after the boat commenced running. There were four water cocks on each boiler, for ascertaining the height of the water.

The lowest of these cocks was three inches above the highest part of the upper flues, and each successive cock was placed three inches higher than the preceding one, the upper cock being twelve inches above the flues. Witness had not proved the boilers. Thinks that the boilers should have borne 50 pounds to the square inch, if there had been no previous imperfection. The strength of copper as compared with iron, is nearly as 3 to 5. The difference, witness says, is above 60 per cent. in favour of iron. Copper has been preferred as a material for boilers because it suffers less from corrosion. Copper is weakened by the action of heat at about 250°. The strength of iron is increased when exposed to heat up to a certain point of temperature. A copper boiler will bear a greater pressure when cold than when heated. An iron boiler, if heated not beyond 450°, will bear a greater pressure than when cold. Has tried experiments with Mr. Stevens on a flat iron boiler, braced at distances of 8 inches with $\frac{3}{4}$ inch brace bolts, at distances of 6 inches with $\frac{5}{8}$ bolts, and at 5 inches with $\frac{1}{2}$ inch bolts. One of the $\frac{3}{4}$ bolts broke at 156 pounds to the square inch. Three of the $\frac{5}{8}$ bolts gave way at 256 pounds to the inch, and the half inch braces stood this pressure without injury. The power was applied by a water press, the safety valve being carefully loaded with an addition of 10 pounds at each trial. Witness thinks, from the appearances of the metal, that the rent of the boilers

* See the figures, page 58.

must have commenced in the arches near their connexion with the after end. Knows Alexander Marshall, and would have no hesitation in trusting him with the care of an engine in any case. Witness employed him to take charge of a high pressure engine last winter.

Testimony of HENRY WATERMAN, JR., *Captain of the N. E.*

Left New York without working the engine warm, and run the steam down very soon to 4 or 5 inches. The Boston left soon after us, and came up strong till we got through the gate. Then got on 10 or 12 inches of steam, and drew away from the Boston. Might be $1\frac{1}{2}$ or 2 miles ahead at $7\frac{1}{2}$ to 8 o'clock. At this time felt a little alarmed for the labouring of the engine in the heavy sea with 12 or 15 inches. Usually works 14 or 18 inches when in full speed. Was often in the fire room, till half-past 10 o'clock, when he retired. Below Falkner's Island, the wheel rope got foul, which brought him on deck, the boat being in the trough of the sea. Crossed the bar, and got into the river at 1 o'clock, it being low water. Made two attempts to land at Saybrook, and failed, owing to there being no one to fasten a line on shore. Anchored in consequence of a difficulty in moving the valve rods, and blew off the steam. Observed the fireman pumping up one of the boilers, and ordered others to assist him. Examined the water in the other boiler and found it sufficient. When the engineer was ready, got under weigh immediately, and went to the wharf. Heard no complaint of the boat behaving worse than common. Saw nothing unusual or alarming. Carried less steam in the Sound than usual on account of the heavy sea. Should have carried from 12 to 18 inches had the water been smooth. Had a favourable passage, excepting the heavy sea. Did not notice the state of the steam after leaving Saybrook. Had no apprehensions or fears of any kind at that time, and had heard none expressed by the passengers or other persons on board. Had full confidence in the perfection and strength of the boilers and machinery. This confidence was derived from the experience we had already had. Witness has been five years in the steam-boat business, and has had charge of a boat for the last three years. Was making no unusual exertions to reach Hartford early, and felt no inducements to such a course.

Has accidentally fallen in company with other steam-boats since he had run the New England, and has not been able to keep as much steam while so in company, as was desirable, the boilers being too small for the engine, and could not on an average in these cases keep more than thirteen inches. Six persons were blown overboard by the explosion, of whom two were drowned.

Witness is not able to form an opinion as to the immediate cause of the accident.

Testimony of Mr. SAMUEL M. HAYDEN.

The witness lives at Essex, above twenty-five rods from the spot where the disaster occurred. Heard the steam when the New Eng-

land arrived at Essex, the noise of which continued while the boat was landing. Witness doubts if it was three minutes from the time he first heard the steam, till the explosion took place.

His first knowledge of the arrival of the steam-boat was from hearing the steam. There were two distinct explosions, following very closely, and "lapping on to each other." The last explosion appeared to be the sharpest. Fifteen persons have died, including those whose bodies were found in the river.

Such is the evidence which was submitted to our consideration. It was also testified by one of the firemen, that the *damper*, by means of which the fire is held in check, was not closed during the stop at Essex, a fact which has not been recorded in its proper place. We consider it a remarkable fact, as well as an important circumstance in respect to the success of our investigation, that we have been able to obtain the testimony of the engineers and firemen who were on duty at the time of the explosion, all of whom were providentially saved. This has relieved the case from much of that obscurity which has rested on other disasters of this kind, where those immediately in charge of the boilers and engine, have been the principal sufferers.

We annex sketches of the longitudinal and cross sections of the boilers of the New England, reduced from the original drafts from which the boilers were constructed, which will serve to illustrate the foregoing descriptions. (See figures, page 58.)

The various theories and conjectures which have been put forward to account for this disaster, may be comprised under the three following heads.

1. The production of some *gas*, (probably hydrogen,) suddenly evolved in great quantity.

2. A supposed injurious *heating of the water legs*, (*d d d* fig. 2,) and lower parts of the boiler, in consequence of the water being driven by the steam into the upper part of the boiler, and perhaps causing a rapid production of steam on its return to the heated metal.

3. A *deficiency* at the time of the accident, *in the quantity of water* which it is necessary to carry in the boilers, owing to the carelessness of those in attendance, or to their being deceived in their examinations of the water cocks. It has been supposed that the metal of the boilers may thus have been weakened by heat, or that the sudden suffusion of water on the metal thus heated, occasioned by the sudden discharge of steam at the safety valve, may have generated steam in such quantity, and in a manner so instantaneous as to destroy the boiler.

4. *Stress of steam* accumulated beyond what the boilers were able to sustain.

1. *It is supposed by some that the explosion was produced by gas.*

On this suppositon we may remark, that upon our arrival at the scene of the disaster, we found this to be a favourite hypothesis with

a number of sensible and reflecting men, who were so strongly impressed with the energy of the force requisite to produce so powerful an explosion, that they were disposed to look for some extraordinary cause. We cannot, however, see grounds for adopting this view. Even in the case of iron boilers, heated red hot, we believe that the production of hydrogen gas in any such quantity as to cause the explosion of a boiler, has never yet been proved, although it is undoubtedly true that iron thus heated has the power of decomposing water and evolving hydrogen gas; and the gas, when thus liberated, would, indeed, act as a force auxiliary to the steam; but the decomposition, and consequent production of hydrogen, would have its limits from the oxidation and cooling of the iron. Steam has never been decomposed by heat alone. Water yields up its elements, oxygen and hydrogen, to electricity, especially to galvanic electricity, but not to simple temperature, however high. Heat requires to be aided by the attraction of some substances which will remove the oxygen, and thus liberate the hydrogen. Copper cannot do this, even at a white heat. Copper thus heated would produce a great abundance of steam, but no inflammable gas.*

In the boilers of the New England, there was no iron: all the pins, bolts, and rivets, were of copper. There were, indeed, a few square feet of iron plate in the chimnies, to which the steam had access on one side, and there can be no doubt that these flues frequently became red hot. The surface exposed to the steam is, however, soon oxidized by the vapour, especially that from saline fluids, and must then become incapable of decomposing water.

Granting, however, that in the case before us, this decomposition did take place to a certain extent, the hydrogen gas, being the lightest body known, would not descend into the boiler, but would pass on into the steam tube, and into the cylinder. Here, indeed, it might, to a degree, repress the strokes of the piston, being itself uncondensible; but it would ultimately pass into the condenser, and be thrown out into the atmosphere through the air pump. Its production, if it ever happen would be confined to a few days when the chimney was new, and the quantity would be too small to be of any importance. Since hydrogen gas, when mixed with a certain quantity of air, and ignited, has the property of exploding with violence, it has been sug-

* Copper will pass, in a melted state, and at a white heat, through a high column of water, and remain for some time ignited at the bottom of the vessel. Heated copper generates steam with great rapidity. According to the statement of Mr. Adam Hall, ten pounds of copper heated to such a degree of redness as to be merely visible in the dark, will convert a pound of water into steam, making more than twenty-seven cubic feet at the common atmospheric pressure. It follows, therefore, that copper flues having, on the whole, an extensive surface, and great weight, may produce an uncontrollable quantity of steam, even at a heat far below redness. This fact suggests an additional reason, if any were necessary, why the water should be most anxiously guarded from falling below the top of the flues. (See the valuable experiments of Professor Johnston *on the comparative quantities of steam produced by heated metals*, in the American Journal of Science.)

gested, that its agency in steam-boat explosions is due to this property, and not to its acting simply as an auxiliary to the pressure of the steam. A volume of common air equal to several volumes of the hydrogen present, would be required to render the mixture explosive; but we know of no source whence such a quantity of common air could be supplied. We therefore conclude that, in the actual circumstances, neither hydrogen gas, (nor, as we believe, any other gas,) can ever aid in the explosion of a steam-boat boiler, except simply by adding just so much elastic power as the same volume of steam, at the same high temperature would produce, and no more.

2. *Others ascribe the explosion in question to an over heating of the water-legs of the boiler.* We have no proof that metal can be thus heated while under the superincumbent pressure of a body of water, with a fire of pine wood as used in these boilers. It ought also to be objected that the water-legs are, for the most part, near to the bottom of the flues, and are therefore less exposed to the action of the fire than the arches and higher parts of the boiler. No difficulty of this kind is known to occur in other boilers of like construction. In the boilers of locomotive engines, a strongly heated blast is driven through copper flues placed in contact with a much smaller volume of water, under circumstances which are vastly more suited to produce the supposed effect, and yet these boilers are used with safety. We cannot, therefore, ascribe the explosion to this cause.

3. *By others the explosion is ascribed to deficiency of water.* To this cause, all disasters of this kind, are usually ascribed, and there is, perhaps, a prevailing disposition among practical men to account for them in this manner. That there is always some hazard from this source attending the use of steam boilers, especially those of ordinary strength, is undoubtedly true; and in the absence of all evidence in the case, it might be proper to resort to this as the most probable conjecture. But it would be folly to adopt this opinion, when contrary to all the evidence, and especially so in a case where adequate cause could be shown without resorting to this hypothesis. To insist, in all such cases, as has too often been done, that this is the true and only cause of these disasters is, as we fear, but too likely to perpetuate their occurrence; for so long as this opinion is cherished, the security afforded by an increased strength of the boilers is likely to be neglected. The tremendous exertion of force in the case under consideration, has been urged as evidence that the explosion was of this character, but, as we think, without sufficient reason. The aggregate expansive force upon the whole internal surface of each boiler could not have been less than 3,000,000 pounds, which must be acknowledged to be adequate to the effect produced. Besides this, we have noticed that the great external arch and outer shell of either boiler, was not torn asunder, except as it was separated from the ends and the inner shell, and this part of each boiler now constitutes one extensive but unsightly sheet of copper. The upper flues, too, with their connecting parts, as also the steam chimney, have received no injury: which facts appear unaccountable, if the

case was of that highly explosive kind which has been supposed. The explosion of both the boilers, at almost the same instant of time, has also been urged in support of this hypothesis, but we do not see that any confirmation can be derived from this fact; for it is known that the two boilers were supplied from different pumps, were entrusted to the care of different hands, and were in these respects entirely independent of each other. It is therefore not probable, to say the least, that both the boilers should become fatally deficient in their supply of water, at exactly the same time. And furthermore, it does not appear that any sudden relief was given to the boilers, either by raising the safety valve, or starting the engine, which in case of such scarcity of water could have caused it to rise suddenly upon the heated metal in the manner supposed. In view of all the circumstances of the case, and of the ample evidence afforded by the present state of the metal and the testimony of the witnesses showing that the boilers were well supplied with water at this time; we reject this supposition as altogether indefensible.

4. We are therefore constrained to adopt the remaining conclusion, and give it as the unanimous opinion of the Board of Examiners,

That the explosion of the steam-boat New England, was caused by the pressure of steam, produced in the ordinary way, but accumulated to a degree of tension which the boilers were unable to sustain.

It apears that the boat started from Lyme, very strongly, under the head of steam which had accumulated while landing at that place: that immediately after, the pilot found it necessary to order the steam to be shut off from the engine in order to facilitate the steering of the boat, that the steam continued shut off (throttle valve closed, or nearly so,) during the greater part of the passage from Lyme to Essex, a distance of three or four miles; that when the boat arrived at Essex, there was, by the firemen's gauges, a pressure of about twenty-six inches; (equal to a column of fifty-two inches of mercury, or near twenty-six pounds to the square inch;) that the safety valve was not raised to blow off the steam while the boat stopped at Essex; that previous to the explosion, the float rod of one of the gauges had risen to the boiler deck, a height of twenty-eight inches; according to Mr. Potter's admeasurement, and that this pressure was rapidly increasing; while on no former occasion, had it been known to exceed twenty four inches.* As the mercury remained in two of the steam gauges, the greatest pressure must have been less than thirty-two inches, and we conclude that the steam was allowed to accumulate nearly, or quite, to thirty inches, and that at this juncture the weakest part of one, or both, the boilers gave way, tearing the adjacent parts asunder, breaking in rapid succession the nearest brace bolts, and involving all else in one sudden and common ruin. The noise of the steam previously heard on shore by Mr. Hayden, appears to us to have been the natural discharge of surplus steam by the safety valve, beyond what the weights would confine, as in the case of twenty-four

* By the gauge in the engine room.

inches pressure, mentioned by Mr. Potter. This partial blowing off, which indicated great pressure, does not appear to have been particularly noticed by the engineers, or other persons engaged in active duty at the time. It is true that the amount of pressure proved by the two firemen, was not so observed by the engineers; but Younger tells us that he did not see the engineer's gauge while at Essex, and furthermore that he could not see it while standing at his post; and it is conceived that Marshall, in the obscurity of night, and while assiduously engaged in his other duties, might easily mistake, or overlook, the movements of so small an instrument as the gauge rod.

An almost simultaneous explosion of two boilers, may probably be accounted for by considering that they were as nearly as possible of the same strength, and were necessarily subject to the same pressure; or we may reasonably suppose an instantaneous impulse or concussion to have been communicated from the first boiler to the second, while the latter was strained to the extreme limit of its strength.

Our conclusion may perhaps be met by Mr. Hall's opinion, that the boilers would have sustained a pressure of fifty pounds to the inch, provided that every part was sound, and bore its proper share of the strain. But with all due deference to this opinion, we must still think his estimate a great deal too high; and it does not appear that a copper boiler of this description has ever been proved to such an extent. We learn from the experiments of Guyton Morveau, that the tenacity of iron as compared with copper, is nearly 549 to 302, showing a difference of more than 80 per cent in favour of iron. Now if we make our estimate from the pressure at which these boilers are supposed to have given way, they would, if constructed of iron of the same thickness, have sustained a pressure of about fifty-four pounds to the square inch; which, in our view, is more than twice the pressure that a prudent engineer would have carried upon them. It is believed, also, that the actual strength of these boilers, as compared with those which are usually constructed for steam of high pressure, will fully justify these conclusions.

Reports have been in circulation, that the explosion of the New England was occasioned by *racing*; but after careful investigation, we see no reason to connect this accident with any supposed competition with other steam-boats.

As regards the bearing of our conclusion, we do not feel it necessary to attach any high degree of blame to those who were in the charge of the boat and engine, at the time of the accident; and they may justly be exonerated from any charge of voluntary or wilful misconduct. Their leading error, or fault, seems to have been, too much confidence entertained by them in the security of the boilers, strengthened perhaps by too little acquaintance with the management of engines of this powerful kind; by which means they may have been led to disregard, or overlook, the rapid production of steam which is necessary to such engines. It seems necessary, in managing boats of this description, to close the damper of the chimney, and

to open the safety valve, immediately when a stop is made, and to continue these precautions so long as the detension shall exist.

The Board of Examiners are fully and unanimously of the opinion, that in the construction and management of this boat, the steam-boat company used their best endeavours for the accommodation of the public, and committed the navigation of it to persons of established reputation for prudence and skill in their profession.

The proprietors of the New England, appear to have spared no expense in procuring a safe and efficient steam-boat for the conveyance of passengers; and the disappointment and deep regret resulting from this sad catastrophe, is doubtless more largely shared by them than by the great mass of their fellow citizens. Perhaps one of the remote causes of the disaster may be found in their desire to satisfy the wishes and expectations of the public, in furnishing copper boilers for the New England as well as for the Oliver Ellsworth, after the failure of an iron boiler, which was formerly used in the last named boat. It may be presumed that copper boilers will be less likely to be preferred hereafter, especially for steam-boats in which the late improvement of working the steam expansively has been adopted.

The great practical object aimed at in this inquiry is to promote by any practicable means, the future safety of passengers travelling in steam-boats. It is not sufficient that the number of these accidents, as compared with the increased number of steam boats, is gradually lessening, or that this mode of travelling is even now safer, on an average, than any which is afforded by the ordinary method of conveyance. Much yet remains to be done by way of affording additional security.

The great advantages which result from working steam expansively are such as to preclude the idea that it will ever be abandoned, and it is beginning to be adopted in the British steam-boats. But we think that the owners of our steam-boats are imperatively called upon to adopt a stronger form of boiler for engines of this description. Experience has shown that when the form of the boiler is perfectly cylindrical in all its principal parts, and of small diameter, that even a rent in the boiler, or an absolute deficiency of water, is but seldom attended with calamitous results; while the great range of strength beyond the ordinary pressure of steam, which such boilers possess, precludes the accumulation of pressure to a dangerous point by any of the ordinary detentions or casualties. It is now known that circular flues can be constructed of a very small size with increasing safety and advantage, and we confidently expect that a combination of parts can be made upon the principles here recommended, which shall furnish steam sufficient for the supply of the largest engines; while the degree of safety shall be so much increased, as will reduce the hazard of travelling in steam-boats to an almost inappreciable ratio; and while our rivers shall be navigated by these wonderful vessels, one of the highest gifts of art and civilization, and our plains be traversed by the unrivalled speed of the locomotive, it is hoped that we never may

have occasion to lament such a melancholy disaster as that which has occasioned our present labours.

B. Silliman,
Professor of Chemistry, &c., Yale College.
W. C. Redfield,
Engineer, and Agent of the Steam Navigation Co. of New York.
Denison Olmstead,
Professor of Natural Philosophy, &c., Yale College.
Daniel Copeland,
Engineer, and Manufacturer of Steam Engines, Hartford.
John F. Lawson,
Engineer of the Steam-boat Chief Justice Marshall.

New Haven, November 27th, 1833.

Proofs relating to Mr. Woolf's Invention of applying High Pressure Steam Expansively.

(Continued from p. 55.)

In 1816, an entire new engine was made at Dolcoath mine, by Messrs. Jeffery and Gribble, to work with high pressure steam acting expansively, on Mr. Woolf's system, in one cylinder of seventy-six inches diameter; it answered extremely well, although it never did so much as the engines with two cylinders had done, whilst they were new and in good order; but as they materially fell off in 1817, and 1818; when they got out of order, and as the Dolcoath engine kept up a steady performance of about forty millions, the use of one cylinder for Mr. Woolf's system obtained the preference; and in a short time after Mr. Woolf's patent expired, most of the old Boulton and Watt's engines in Cornwall were altered to work by high pressure steam on his system; some few had an extra cylinder added, but commonly the old cylinder was retained. The advantage of the change from low pressure to high pressure, on Mr. Woolf's system, was manifest in all cases; but it was greater or less, according as the steam was used stronger, and with more or less expansive action.

All the new engines since erected in Cornwall have been made expressly to work on Woolf's system, and always with one cylinder, excepting one instance of two cylinders. In 1820 Mr. Woolf made two engines for the Consolidated mines, each with one cylinder ninety inches diameter; but as neither of those, nor the Dolcoath engine, ever did so much as the engine with two cylinders had done at first, Mr. Woolf still felt inclined to prefer his original plan. Accordingly in 1824, having undertaken to make two large engines at Wheal Alfred, he prevailed on the adventurers to go to the expense of making one of them with two cylinders, of forty and seventy inches diameter, the other engine being the same as those at Consolidated mines, with one cylinder ninety inches diameter; both engines were worked with high pressure steam. The performance in 1825, averaged 40.01 millions with two cylinders, and 42.15 with one cylinder: this was

considered decisive against two cylinders;* and no engines have since been made in Cornwall, either by Mr. Woolf or others; except with one cylinder, to work on his system.

The performance of those engines was very slowly and gradually increased, as appears by the following annual averages of the highest performances that are to be found amongst them each month. Until 1826, their performance remained below that of the first engines with two cylinders, in 1816, which then averaged 46.97 millions. Previous to 1826, the steam cases of the cylinders were not clothed, but exposed to the air.

Years.	Millions.	Years.	Millions.
1816	36.3	1823	42.1
1817	41.6	1824	42.5
1818	39.3	1825	45.4
1819	40.0	1826	45.2
1820	41.3	1827	59.7
1821	42.8	1828	77.3
1822	42.5	1829	76.2

The advance made in 1827, and since that time, has been effected by good management of the engines, chiefly by clothing all the steam vessels, and thus preventing any needless waste of heat by radiation; also by using better boilers;† but the engines are strictly according to Mr. Woolf's system of high pressure acting expansively in one cylinder.

Great credit is due to Captain Samuel Grose, who began the race of improvement in management; first, in an engine which he made at Wheal Hope, in 1825, and still more in another which he made the next year at Wheal Towan, with an eighty inch cylinder; in 1827, it averaged 58.18 millions, its highest being 62.22 in July.

At the end of 1827, Mr. Woolf removed the ninety inch cylinder engine before mentioned, at Wheal Alfred, (that mine having ceased working,) to the Consolidated mines, and by good management and clothing, it raised 64.42 millions on the average of the last three months, the highest being 67.10 in November.

In 1828, Captain Grose brought the annual average performance of Wheal Towan engine to 77.29, the highest being 87.05 millions; in

* The engine with two cylinders had boilers on a complicated plan, which did not answer well, and the other engine had very good boilers. If both engines had been worked with equally good boilers, the two cylinders would have made the best performance.

† See Mr. Taylor's paper on these boilers, Phil. Mag. and Annals, N. S. vol. i. p. 126; they are long cylinders, containing cylindrical tubes within them for the furnaces; on a plan which was first brought into use for high pressure steam by Mr. Trevithick, in 1804.

April,* Mr. Woolf's engine averaged 62.57, and its highest was 67.56 millions in May. These striking examples stimulated the exertions of all the Cornish engineers to take the same care in management, and with such success that the average of all the engines in 1829, was 41.22 millions; although in 1814, before Mr. Woolf's system was begun, it was only 20.37, or less than half. The number of engines, and the power exerted by them, is more than doubled, whilst the quantity of coals consumed by them is sensibly lessened.

The importance of such an increase of power from the same fuel, to the success of mining in Cornwall, may be estimated by the following account of the Consolidated and United mines, which are worked by one company of adventurers, and form the largest mining establishment in existence.

The United mines are worked to a loss, and are only kept drained to about one-third of their depth, in order to cut off some water which would otherwise flow into the Consolidated mines. These mines have been more productive during the last seven years, than the average of mines in Cornwall. The following particulars are collected from the accounts which have been printed annually in a series of reports by Mr. John Taylor, and from the monthly reports on the engines.

The Consolidated mines recommenced working in 1819, after laying drowned for fourteen years, and 65,000*l.* was advanced by the new adventurers, to bring them into operation. During the years 1819, 1820, and 1821, the expenditure exceeded the returns by 74,078*l.*; but during the years 1822, 1823, and 1824, a profit of 51,561*l.* was made.

At the end of 1824, 10,000*l.* more was subscribed to continue the United mines, which were given up by their original proprietors. The capital to be repaid to the adventurers at the beginning of 1825, including interest then due upon the several advances, was 55,382*l.* During the last five years, the Consolidated and United mines together have produced a profit of 63,604*l.*; whereby all the capital subscribed, together with interest upon it, has been paid off, and an actual gain was made in 1829, in addition to the value of the stock of materials on the mines.

The total expenditure in all the eleven years, has been 824,585*l.*, and the returns 865,672*l.*; hence the profit beyond the repayment of the capital subscribed, has been 41,087*l.* in eleven years; or interest at five per cent. per annum being allowed on the sums subscribed, until the periods of repayment, the clear gain is stated, in the printed accounts, to be only 10,244*l.* to the adventurers.†

The expense of draining the water from both mines, as stated in

* See Mr. John Taylor's account of the performance of this engine in May, 1830, when, on an accurate trial of about two hours and a half working, it raised 92.33 millions.

† This does not include any valuation of the materials in use in the mines, although the cost of all materials is included in the amount of total expenditure. The materials would sell for a large sum, but that can scarcely be reckoned as a part of the profit, because from the uncertainty of mining prospects, a mine cannot be given up in time to realize it: the working is usually continued at a

the annual accounts for the last five years, has been decreasing each year from 17,776*l.* to 11,958*l.* per annum; although the monthly reports on the engines show that the number of engines has been increased from four to eight, and the power exerted by them increased from 432 to 513 horse power. The cost of drainage has averaged 13,826*l.* per annum. The average performance of the engines has been improved from 30.04 to 51.81 millions, during the last five years, averaging 39.36 millions; being more than double 19.38 millions, which was the average performance of Mr. Watt's engines in 1813, when Mr. Woolf went into Cornwall; therefore, if such engines were now used at the Consolidated mines, the expense of drainage might be expected to average (13,826*l.* × 39.36 ÷ 19.38 =) 28,100*l.* per annum, or 14,274*l.* more than it has been; and it is that saving which has constituted the whole of the profit during the last five years.

During the last five years the mines have produced 73,561 tons of copper ore, which on an average has yielded nine and a half per cent. of copper, and thirty-six and a half tons of tin ore. The ores have been sold for 548,872*l.*, of which one twenty-fourth has been paid to the lord of the soil as rent. The total cost of working the mines has been 426,444*l.*, leaving a clear profit of 63,604*l.*

The above is but a limited view of the advantages arising from the use of Mr. Woolf's engines; for if the mines had been begun in 1819, with Mr. Watt's engines, the loss during the first years would have been considerably greater than it was, and the mines would have continued to be unprofitable for a longer time than three years; also the subsequent profit would have been so much smaller than it has been, that it would not have repaid the previous loss (and interest upon the capital advanced) for a long time to come, beyond the present date, supposing the mines to continue to yield ore. In fact, if these mines could have been worked with profit by Mr. Watt's engines, they would not have been given up as they were, twenty-five years ago, when they were not worked out so deep, or so extensively, as they are now.

Engines and cost of drainage at the Consolidated and United Mines.

Date.	No. of Engines	Horse power.	Average Millions.	Cost of drainage.	Clear profit.	Expense saved.
1825	4	432	31.04	£17776	£4169	£9824
1826	6	422	32.31	13543	7648	8337
1827	8	378	36.76	13426	13294	11254
1828	8	526	44.86	12428	22314	15452
1829	8	513	51.81	11958	16179	19042
Avers.	7	454	39.36	£13826	£12721	£12782

loss until a debt is incurred, and when the adventurers become too much discouraged to make further advances, the mine is given up, and the materials sold to pay the debt.

The last column of the table shows the saving that has been made by the use of Mr. Woolf's engines, or the increase in the cost of drainage that would have been incurred by using Mr. Watt's engines, raising twenty millions, instead of the engines actually used; those savings are included in and form part of the profits, and without them the extra expense would have absorbed more than all the profit in 1825, 1826, and in 1829, so that instead of profit the adventurers would have lost 5,655*l.* in 1825, 689*l.* in 1826, and 2,863*l.* in 1829. Or, taking the whole of the last five years, no profit would have been made; and it would have been more advantageous to the adventurers to have broken up their establishment, and sold the materials, than to have continued working.

In conclusion, it may be safely asserted that the saving in fuel resulting from the general use of Mr. Woolf's system of working steam engines by high pressure steam acting expansively, (instead of Mr. Watt's system of working them by low pressure steam acting expansively,) constitutes the present profits of deep mining in Cornwall.

JOHN FAREY.

London June 5, 1830.

[*Rep. Pat. Inv.*

An Anti-Sediment.

The substance employed here (Craighall Colliery,) is known by the name of *comings*, being the radicles of barley, produced in the process of malting, which are separated before the malt is sent to market. About a bushel of these is thrown into the boiler, and when the steam is again raised, an immediate effect is visible, for there is not only a plentiful supply of steam to produce the full working speed of the engine, but an excess of it is going to waste at the safety valve. This singular effect will continue several days. Such is the fact; but the principles by which the vegetable matter acts are not very obvious, as it is doubtful whether it acts chemically or mechanically; if its action is mechanical, chaff or saw dust may produce the same effect.—*Milne's Practical View of the Steam Engine.*

[*Mech. Mag.*

The Iron Steam-boat Alburkha.

This vessel is now in the river Niger, with the Quorra steam-boat, and seems to have been the favourite of the two vessels since they departed on their interesting expedition. The advantages of iron vessels in warm climates, are ably pointed out in a short extract we gave in our last number from Chambers' Journal; and these advantages seem to be in no wise exaggerated in the instance of the Alburkha,

according to the reports received from those embarked in her. This vessel was built by Mr. Laird, of Liverpool for the purpose of navigating the shoal water of the river, and we understand that he has since constructed another for the interior navigation of Ireland. We have no doubt that these vessels from their vast superiority over those of wood, and their durable quality, will speedily be numerously employed. [*Nautical Magazine.*

Cast Iron Beams.

In the early application of cast iron beams, it often happened that a beam broke without any apparent reason; and it was ultimately discovered that slight vibrations, or constant slight shocks, had the effect of breaking even heavy beams; this lead to the application of a soft material placed under the parts of the beam, where supported by masonry, which, acting as a damper to vibration, proved of great utility in preserving cast iron beams. The cast iron chairs which receive the rails for railroads, have been found to break in a similar manner, and in some instances of late, a piece of felting, made of ox hair, and consequently indestructible, has been placed between the stone sleepers and the chairs, which has produced a most advantageous result.

[*Rep. Pat. Inv.*

¶ POPULAR SCIENCE.

No. VII.

On the Instincts of Birds. By JOHN BLACKWALL, *Esq. F.L.S.*

[Continued from p. 72.]

The habits and manners of birds are sometimes so greatly modified by the exercise of the intellectual faculties, that, in many cases it becomes extremely difficult, if not impossible, to determine what is due to their influence; but that no small portion of intelligence is exhibited in the following instances will scarcely be denied.

The white headed eagle, and several of the gulls, which prey upon the finny inhabitants of the waters, frequently save themselves the trouble of fishing, by robbing their more expert and less powerful congeners of the fruits of their industry, occasionally compelling the objects of their violence even to disgorge their undigested food.

The pied and yellow wagtails run close to the legs and noses of cattle which are grazing, in pursuit of the insects disturbed by them. The same motive also induces these and many other birds to follow the husbandman, when he is busy with the plough or harrow; and the redbreast attends the gardener in his labours, and siezes the worms which he turns up with his spade.

Mr. White states,* that the great titmouse, in severe weather, fre-

* Natural History of Selborne, p. 106.

quents houses; and in deep snows, as it hangs with its back downwards, draws straws lengthwise from the eaves of those buildings which are thatched, in order to pull out the flies that are concealed between them; and I have seen hooded crows, on the eastern coast of Ireland, after many unavailing efforts to break with their beaks some of the mussels on which they were feeding fly with them to a great height in the air, and by letting them fall on the stony beach, fracture their shells, and thus get possession of the contents. Perhaps it would not be easy to select a more striking example of intelligence among the feathered tribe than this, where, on one expedient proving unsuccessful, after a sufficient trial had been made of it, another was immediately resorted to.

Chickens, in their early attempts to catch flies and other winged insects, show little or no address, but repeated failures teach them to use more circumspection; and they soon learn to distinguish between an active vigilant prey, and the inanimate substances on which they likewise feed. This cautiousness of proceeding is clearly the effect of information obtained by experience, and affords an example of instinctive power being excited to activity by the intellect; but a still more extraordinary instance of acquired knowledge is given by Montague in the Supplement to the Ornithological dictionary. This gentleman observed two crows, by the sea shore, employed in removing some small fish (the refuse of a fisherman's net,) from the edge of the flowing tide. They carried them, one by one, just above high water mark, and there deposited them under large stones, or broken fragments of rocks, after having amply satisfied the immediate calls of hunger. Now it must be conceded that these birds were aware, that the advancing flood would sweep away their prize, unless they conveyed it beyond the limit of its usual rise, or their conduct is quite inexplicable. It is equally plain that this knowledge, in the practical application of which they manifested so much foresight and sagacity, could be derived from observation and experience only; because, if it originated in a blind instinct, it would be common to every individual of the species, and consequently often displayed; whereas, although I have seen hundreds of crows feeding in situations similar to that above described, I never perceived any of them resort to this effectual means of preserving their prey from the encroaching waters, and I believe the instance related by Montague is solitary in the records of ornithology.

This propensity to hide the food it cannot devour is not, however, peculiar to the crow. I have noticed it in the raven and magpie; and rooks, in the autumn, frequently bury acorns in the earth, probably with the intention of having recourse to them when their wants are more urgent; but, sometimes, forgetting where they have concealed them, they germinate, and not unfrequently excite surprise, by the singularity of the situations in which they grow, far distant from any trees by which they could have been produced, and where it is very evident that they have not been planted by man.

It may be proper to remark here, in order to obviate misapprehension, that, notwithstanding the circumstances attending this seeming-

ly provident mode of securing a supply of food against a future occasion, sometimes afford unequivocal evidence of an intelligent and discerning agent, yet the act of hiding is induced by a purely instinctive propensity. This will be admitted by every one who considers that the species of birds which are remarkable for this peculiarity, practise it, however well they may be fed, when brought up in a state of domestication.

In addition to the numerous proofs of the intelligence of birds already given, I may mention their susceptibility of receiving instruction by education. Thus eagles, falcons, and hawks, have been trained to limit the effects of their instinctive propensities to kill, to a particular species of game; and to return to the call and line of the falconer, after having struck down the quarry. The cormorant, too, was formerly employed with success in taking fish. Here, then, not only great attachment to their keepers, and much docility of disposition, are evinced by birds which are naturally wild and voracious, but a considerable share of memory is displayed, and a surprising degree of control exercised, over some of their most active instincts.

Several birds of the finch, grosbeak, and warbler genera, acquire the art of piping long and difficult tunes with facility and precision; and it is well known that some of the parrots, and also the jay, starling, jackdaw, and magpie, readily learn to pronounce single words, and even short sentences, with considerable exactness. Yet, although I have excellent opportunities of observing the last species, and have been almost in the daily practice of investigating, I never knew it display any unusual exertion of its capacity for imitation in a state of nature, though, when domesticated, it appears to have this faculty more highly developed than almost any other British bird.

The congregation of gregarious birds, which takes place in the autumn, when they have finished breeding, is perhaps intended to promote their mutual security, as they are much less liable to be surprised by enemies, when associated together in large numbers, than they are when separate. What tends to strengthen this opinion, is the fact, that some species provide for the general safety, by appointing sentinels to give notice of approaching danger. This social disposition, which (with the well known exception of rooks) usually continues no longer than the next pairing season, seems, from the uniformity of the actions that result from it, to be of instinctive origin; though it certainly would be difficult to bring any direct proof that such is the case.

In treating of the migration of birds, Dr. Darwin observes, that as all species are capable of remaining throughout the year in those countries in which they were bred, any departure from them must be unnecessary, and therefore cannot be instinctive. This reasoning, however, is extremely fallacious, inasmuch as it restricts the operations of instinct solely to what is necessary; whereas, we have seen that the singing of birds, and the practice of concealing their superfluous food, though not absolutely indispensible, are, nevertheless, decidedly instinctive. It is, moreover, built on the gratuitous assumption, that several of the periodical summer birds, as the swallow, flycatcher,

cuckoo, goat sucker, &c., which feed almost entirely on insects, and consequently would not be able to procure a sufficient supply of nourishment in the winter months, have the property of passing the cold season in a state of torpidity; an hypothesis directly at variance with well established facts. Indeed how very defective and unsatisfactory the arguments advanced in support of the hybernating system are, does not require insisting upon, as those who have considered the subject impartially, must be well aware, that they are almost wholly founded on the heresay reports of ignorant and credulous persons.

The history of the cuckoo proves most incontrovertibly, that the propensity to migrate in this species is instinctive, since nearly all the young ones brought up annually in the north of Europe, quit it without receiving the least instruction that such a proceeding is requisite, and without any guide to direct them in their novel undertaking. But I forbear to dwell on the instincts of this extraordinary bird, partly on account of their being so very anomalous, but chiefly because I have considered them at length on a former occasion.* The highly curious fact that the swallow, house-martin, sand-martin, and puffin, sometimes leave their last hatched brood to die of hunger in the nest, in order to accompany their species in their autumnal migration, is alone sufficient to establish the instinctiveness of that inclination which can thus overcome their parental affection,—a feeling so energetic as frequently to counteract one of the most powerful laws of nature, self-preservation. No theory, in short, which is not founded on the opinion that birds of passage, in undertaking their annual journeys, are influenced by an instinctive desire to migrate, liable to be called into action by various exciting causes, can satisfactorily account for the remarkable phenomena which result from this periodical disposition to wander.

The certainty with which the carrier pigeon directs its course towards its accustomed home, from distant places where it has never been before, after every precaution has been taken in its conveyance to prevent it from obtaining any knowledge of the way by observation, must, as well as the act of migration, to which it bears a striking resemblance, be likewise attributed to instinct.

It appears, then, from the foregoing observations, that the principal actions of birds, though liable to be considerably modified by the operations of the intellectual powers and changes of organization, as well as by various external circumstances, are, contrary to the opinion of Dr. Darwin, decidedly of instinctive origin.

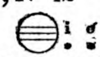
Many additional arguments might be advanced, and a multitude of highly respectable authorities quoted, in support of this doctrine; but conceiving that sufficient evidence has been already produced, I shall only add that I am not aware of any serious objection which can be urged against it.—*Memoirs of the Literary and Philosophical Society of Manchester, Second Series,* vol. v.

[*New Ed. Philos. Jour.*

* See observations conducive towards a more complete history of the cuckoo, printed in the fourth volume of the new series of the Society's Memoirs.

CELESTIAL PHENOMENA, FOR MARCH, 1834.

Calculated by S. C. Walker.

D.	H.	M.	S.	
1	6	18	20.1	Em. ♃ 2 Sat. 
7	8	7	34.9	Em. ♃ 1 Sat.
8	8	54	6.2	Em. ♃ 2 Sat.
11	1	7		☿ Greatest elong. East 18.°4.
12	6	20	34.0	Em. ♃ 3 Sat.
13	13	9		♃ ♀ ☽ ♃ North 3.°5. 
14	10	3	17.6	Em. ♃ 1 Sat.
17	6	11		Im. *o* Tauri, 5, N 90° V290°
17	7	37		Em. *o* Tauri, 5, N112° V339°
19	6	11		Im. 58 Geminorum, 7, N 90° V278°
19	7	10		Em. 58 Geminorum, 7, N 42° V267°
19	8	15	16.2	Im. ♃ 3 Sat. 
19	10	22	50.8	Em. ♃ 3 Sat.
21	16			♄ ☌ γ^1 Virginis ♄ South'. 8'.
23	6	27	46.4	Em. ♃ 1 Sat.
23	17	43		♂ ☌ ♅ ♅ North 32'.
24	17	11		♄ ☌ ☽ ♄ South 2.°5.
28	16	15		Im. ψ Ophiuchi, 5, N189° V211°
28	16	30		Em. ψ Ophiuchi, 5, N196° V221°
30	8	23	16.4	Em. ♃ 1 Sat.

Remarks on the table of Celestial Phenomena, for March, 1834.

The Celestial Phenomena for March, are computed for mean time of that place in Philadelphia, which is 5 hours, 0 minutes, 43.9 seconds west of the meridian of Greenwich, and is in latitude north 39° 56′ 59″. The time is reckoned after the manner of astronomers, beginning the mean solar day at mean noon, and reckoning forward twenty-four hours to the next mean noon.

The phases of Jupiter's satellites are as seen in a telescope that inverts.

The * with *i* over it, indicates the place of the satellite at immersion.

The * with *e* over it, indicates the place of the satellite at emersion.

In the lunar occultations, the figure after the star's name denotes its magnitude.

The angles with the letters N and V before them, respectively indicate the point on the moon's limb at which the immersion or emersion of the star takes place as seen in a telescope that inverts; these angles are reckoned westward round the circle; those with N over them from the north point of the moon's disk, those with the V over them from the vertex or highest point of the moon's disk.

These phenomena have been computed from the British edition of

the British Nautical Almanac, a work that should be in the hands of every astronomer.

The lunar occultations of stars of the seventh magnitude have been computed from the elements in the Berlin Ephemeris, this list contains only those visible at Berlin.

The emersions of Jupiter's satellites in this month are marked immersions in the American Almanac for this year, probably from an error of the press.

Meteorological Observations for December, 1833.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	34°	44°	29.80	29.80	W.	Moderate.		Lightly cloudy—clear.
	2	36	39	.90	.90	NW.	do.		Cloudy day.
	3	35	40	30.04	30.06	E.	do.		Rain.
☽	4	37	42	.06	.06	E.	do.	0.60	Bain.
	5	31	40	.06	.06	E.	do.		Cloudy day.
	6	34	43	.10	.15	W.	do.		Clear day.
	7	31	42	.20	.20	E.	do.		Cloudy day.
	8	41	44	29.94	29.70	E.	Stormy.	1.90	Rain—cloudy.
	9	31	42	.20	.20	NW.	Moderate.		Clear day.
	10	32	40	.30	.30	W.	do.		Clear day.
⊗	11	26	37	.80	.80	W.	do.		Clear day.
	12	23	42	.84	.90	W.	do.		Clear day.
	13	22	21	30.00	.85	NE.	do.		Clear—cloudy.
	14	23	30	29·60	.75	NE.	do.	0.25	Snow—stormy.
	15	24	30	30.00	.80	NE.	Blustering		Cloudy day.
	16	34	39	29.30	.25	NE. S.	do.	1.00	Rain—heavy gale—drizzle.
	17	38	37	.35	.40	SE.	Calm.		Foggy—cloudy.
	18	32	40	.80	.90	NW.	do.		Cloudy—clear.
☾	19	25	32	30.00	30.10	W.	do.		Clear day.
	20	25	35	.10	.00	N. S.	do.		Lightly cl'dy: cloudy: rain in [the night.
	21	32	40	29.90	29.90	W.	Moderate.	0.25	Clear day.
	22	27	38	30.00	30.00	W. SE.	do.		Lightly cloudy: cloudy: rain [in night.
	23	36	35	29.60	29.56	S.	do.	0.05	Drizzle: cloudy.
	24	36	35	.90	.90	S. W.	do.		Fog—drizzle—cloudy.
	25	34	36	.80	.90	NW.	Blustering		Clear day.
☺	26	29	32	.90	.90	W.	Moderate.		Clear—lightly cloudy.
	27	24	32	.90	.90	W.	do.		Clear day.
	28	25	38	30.00	30.00	W.	do.		Clear day.
	29	30	34	.00	.00	SE.	do.	0.15	Cloudy—rain.
	30	34	44	29 90	29.85	W.	dd.		Cloudy day.
	31	34	40	.90	.90	W.	do.		Clear day.
	Mean	30.80	37.52	29.84	29.84			4.90	

	Thermometer.	Barometer.
Maximum height during the month,	44. on 1st. 8th. 30th.	30.20 on 7th.
Minimum do. . .	21. on 13th.	29.20 on 9th.
Mean do. . .	34.16 .	29.84

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

MARCH, 1834.

Remarks, by the Editor, on a patent for "Discoveries in Natural Philosophy, reduced to practice," made by the late Horatio Gates Spafford, of Lansingburg, New York. Granted in pursuance of a special Act of Congress, passed July 3d, 1832; *issued July 5th,* 1833.

We promised in our last number to publish some remarks upon the above patent, and this promise we now proceed to redeem. The act of Congress under which it was granted will be found at page 2, of vol xi, accompanied by some remarks, indicating that we had become acquainted with the supposed discovery of the applicant; we say *supposed*, because we have no doubt that when the thing was first proposed, it was believed to be founded on correct principles, although, as we shall prove, such an idea is without any foundation in "Natural Philosophy."

It is unnecessary to name the two gentlemen from whom the information of which we are possessed, was derived; they, however, are residents of the city of Philadelphia, and one of them, at least, has paid a high price for his knowledge: to each of them Mr. Spafford had communicated his whole plan, without the slightest obligation of secrecy. One of these gentleman, governed more by the confidence which he placed in the projector, than by careful investigation, was, for a while, lead away by it; the other, a professed mechanician, perceived at once the fallacy of the thing proposed, and in order to render this evident to the projector, a model was actually constructed, which, if

conviction had been possible, would have demonstrated to him the hollowness of the whole scheme.

We most sincerely wish, that it was in our power to give a more favourable opinion of this pretended discovery; for independently of the benefit which would be derived from it by the heirs of the deceased, were it valid, its advantages to the public would be incalculable, and it would make a new era in the progress of the useful arts. We are unwilling, also, to dissent from the opinions so confidently entertained by some highly respectable individuals, whose names had a well deserved influence with the committee who reported the bill, which was eventually passed by Congress into a law. In the certificates given, it was declared that the discovery embraced a new principle in mechanical power, the application of which was more important to the interests and honour of the country, than any other discovery made since we have been a nation. An opinion was also given that it would prove to be ten times more valuable than the exclusive use of steam power, in any country. How many of the individuals who furnished such opinions two or three years ago, still retain them, we do not know; but we are very apprehensive, that some of them, at least, would be more than willing to withdraw their endorsement.

There is one feature in this contrivance, which assimilates it to all the schemes of perpetual motion which have been devised, and that is, that it at once contradicts the law, that action and reaction are equal, and exerted in contrary directions; there is, we know, a class of men who will not be startled at this, although they think that they know something about mechanics; we do not pretend to write for such persons, because we have not time to begin with them at the alphabet of the subject, and to accompany them until they have acquired some knowledge of the first principles of its grammar. The only successful teacher of men of this class, is experience, and even his lessons they rarely comprehend.

The mode of obtaining power which Mr. Spafford proposed to adopt, was the ascent of a lighter through a heavier fluid, during which ascent it should operate upon the floats of a wheel, and turn it by its ascending force, as water does by its descending power, in an overshot wheel. The wheel to be thus acted upon is to be enclosed in a tight cistern, or reservoir; and, supposing the heavier fluid to be water, and the lighter one air, the wheel is to be completely submersed in the former, leaving a space above it, as a chamber for the air. The air to be employed is first condensed by the aid of some apparatus adapted to that purpose, a portion of the *power which is to be gained* by the instrument being employed to effect the condensation; of this power, two or three per cent. is to be sufficient.

Various forms are proposed to be given to the machinery, according to the natures of the light and heavy fluids employed, and by the difference of whose specific gravities, the action is to be produced; for although we have hitherto spoken of cold water and air only, we understand that instead of these, hot water and steam are to be the acting fluids. In this case, the steam is to be generated in a boiler, surmounted by an air tight cylindrical case, within which there is to be

a wheel made like an overshot water wheel; this is to revolve in hot water, the generated steam being conducted under the buckets on one side, and discharged from them into a space above, forming a steam chamber. A pipe is to pass round from this steam chamber, to reconduct the steam under the wheel, a circulation being kept up which is to cause the same steam to operate perpetually, with the assistance of that to be produced from the continuance of the fire.

We have seen several drawings, intended to illustrate the machinery, and give herewith a sketch of one of them, in which water and condensed air are to be used.

Fig. 1.

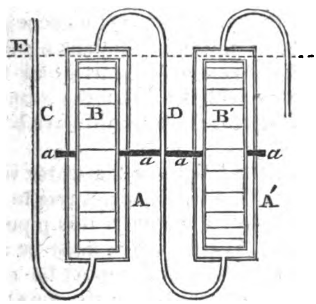
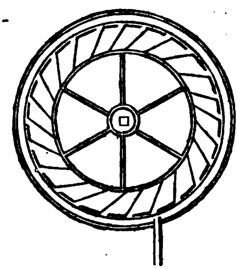


Fig. 2.



A A′, fig. 1, are two cases, which are to contain the wheels, B B′, placed within them. The axes of these wheels, *a a*, must, of course, pass through stuffing boxes in the cases, so that any number of them may be connected together, and their concurrent action obtained. C, is a tube by which condensed air is to be conveyed from its reservoir, (which reservoir is not shown,) and under the buckets of the wheel, B, in the first of the series of cases; D, is a tube by which the air that has caused the first wheel to turn, is to be carried from the reservoir in the upper part of the case, to the under part of the next; and so through the whole series. Fig. 2, is a side view, in section, of one of the contained wheels, under the buckets of which, the air is to operate. In order to their working the more easily, these wheels are not to be heavier than the water in which they revolve, so that they may have little, or no, bearing upon their gudgeons.

That any person, having any pretensions to mechanical knowledge, should be, for a moment, deceived by such a plan of obtaining power, would be incredible, were the fact not proved by the incontrovertible testimony of the names of the persons themselves. So far as testimonials are concerned, there was much presented to Congress, to warrant the passing of the special act under which this patent was granted. Several of the certificates, it is true, are from persons who do not pretend to sustain the invention in all its allegations, but they still go to prove that the power, as employed, is a new principle in hydraulics; and most of them, as we have already stated, express their

conviction, that it will supersede, or nearly supersede, every other plan of driving machinery.

Why it was proposed to use condensed air, we have never been informed, and should be at a loss to divine the reason of it, from the simple argument that the motive power originates in the difference in the specific gravities of the two fluids employed; for if the air is condensed, this difference is lessened, and, of course, the effect diminished in the same proportion. We, it is true, have our conjectures upon the subject, and they are these; on trying the experiment upon the model, with air of the ordinary density, it has been found that it required as much, and indeed more, force to inject it into the buckets, than it was capable of exerting after it was there; condensed air was then tried, and it was found that when *sufficiently condensed*, it would actually pass into the buckets by its own elasticity; no account, however, was taken of the expenditure of power in condensing this air, a thing which it was both easy and convenient to omit: had this been carefully attended to, the result would have been the same as that with uncondensed air; instead of a gain, there would have been a loss of power.

Let the dotted line E represent the height of the water in the cylindrical cases, or cisterns, A A′, and it will, of course, rise to the same height in the supply pipe C; to enable the water in this pipe to overcome the pressure of the column in A, its surface must be acted on with a force equal to that pressure, which force must be continued during the whole time the air is entering; consequently, air of the common density cannot be employed. To overcome this difficulty, let us imagine condensed air to be used, agreeably to the plan under consideration; this condensed air, if the plan be correct, must be capable of operating upon a hundred such enclosed wheels, without any sensible diminution of its elasticity. For this to take place, the air, after it left the first wheel, and arrived above the dotted line in the first cistern, would press upon the surface of the water in it, with a force equal to that of the condensed air in the pipe C, and as these two forces would counterbalance each other, there would be no motion, and the water would rise in that pipe to the dotted line. The communication between A and A′, by means of the pipe D, would not alter this state of things, for fluids press equally in all directions; its pressure upon the water in A, would not, therefore, be lessened by its escape into A′, because a like quantity is to be perpetually supplied, by the revolving of the wheel, to keep up the tension, without which the whole plan would be nugatory.

The question, what is to be the final disposition of this condensed air, will here very naturally be propounded; it was so by us when the nature of this pretended discovery was first explained to us. The reply is, that, of course, after having been allowed to turn fifty or a hundred wheels, it must escape, and, in the mean time, a new and equal portion must be condensed. To show the extent to which the condensation must be carried, in order to enable the air to escape through a hundred cisterns, we will assume that the contained wheels are ten feet in height, which, we apprehend, would be a moderate diameter, if

it were wished to employ the power to any advantage. This would give a column of water of a thousand feet in height, equal to thirty atmospheres, or to a pressure of 450 lbs. upon every square inch. And even this, enormous as it is, would produce no effect whatever, as it would amount to nothing more than a mere counterpoise for the water, it must therefore be carried to a much greater extent to become operative.

We feel inclined to ask pardon of most of our readers, for occupying so much of our space, and of their time, in exposing the fallacy of a thing so manifestly absurd; we will not, therefore, extend the investigation for the purpose of proving that which must, we think, be obvious to every one who is capable of being convinced. But for the particular circumstances under which this thing has been brought before us, the whole scheme would, probably, have been deemed unworthy of any serious examination; the editor of the Journal of the Franklin Institute must, however, consider himself as a public sentinel in such cases, and would be wholly unworthy of the station which he occupies, were he to withhold that information which may prevent the unwary from being led astray by schemes presented to them under a specious aspect; and with the supposed sanctions of a special law, and a public patent. It should be remembered, however, that the law and the patent, are both exparte instruments; the law is passed because the names of those who are supposed to understand the thing in favour of which it is asked, are appended to certificates which appear to render it proper, and the patent follows as a thing of course. We should think it wrong to give, here, the names of those to whose certificates we have alluded, because we have no doubt that the most intelligent of them would gladly have them withdrawn; and now really regret that, in one instance at least, they have manifested less judgment than kindness.

It is scarcely worth while to inquire into the novelty of that which is useless, but we will remark, that a patent was obtained by a Mr. Doll, about eight years ago, for driving a similar wheel by steam, to be applied to it within a reservoir, the wheel being constructed like that proposed by Mr. Spafford. And previously to this, Mr. Genet had obtained his patent for his applications of the "upward forces of fluids," on which subject he published a memorial in the year 1825, which was animadverted upon in the Franklin Journal, for August and September, 1827.

The following quotation from the preface to the second volume of Desagulier's Experimental Philosophy, published in the year 1743, appears so apposite, that we have determined to borrow it for the closing paragraphs of the present article.

"About two years ago, a man proposed an engine to raise by one man's work, about ten times more water than was possible, to a certain height, in a certain time; for which he wanted an act of Parliament, and got a report of the committee appointed to examine the matter, *that he had made out the allegation of his petition.* If this had passed, a great many persons were ready to subscribe a consi-

derable sum to the project; which money, of course, would all have been lost, and perhaps some families ruined; but a nobleman who understands the nature of engines very well, knowing the impossibility of what was proposed, threw out the bill.

"Our legislators may make laws to govern us, repeal some, and enact others, and we must obey them; but they cannot alter the laws of nature, nor add, or take away, one iota from the gravity of bodies."

Remarks on KUGLER's *Planing Machine.*

We noticed this planing machine in the last volume of our Journal, p. 394, and in our notice expressed a fear that the resistance opposed to the motion of the board, by the simultaneous action of the great number of plane irons employed in it, would, especially on cross grained stuff, be so great as to interfere with its utility. Although we have not yet had an opportunity of seeing the machine in action, we have conversed with gentlemen of intelligence who were interested in the discovery of any objections to which it was liable, and whose account of it is such as to show that our apprehensions were altogether unfounded.

We have made the following memorandum of the information communicated, of the absolute and entire truth of which we cannot entertain the slightest doubt. Its ordinary rate of working is the planing, tongueing, and grooving, of six flooring boards, twenty-four feet long, in a minute, or of a corresponding number of those which are shorter. It appears to meet with no difficulty from such as are knotty, or cross grained, the angular direction of the irons causing them to cut without the slightest tearing. The machine, it appears, will take off twenty-three shavings from the top, and an equal number from each side, at one operation.

The inquiries of the gentlemen to whom we alluded in the commencement of this article, were directed solely to the ascertaining of the originality of the invention, in those particulars which constitute the claim; a point upon which we did not entertain any doubt whatever, and it is to us a source of unmixed pleasure, to find that we were incorrect in the only doubt which we did entertain, namely, that respecting the practical operation of the machine.

EDITOR.

On the principles which determine the Hardness of Iron Castings, and the mode of selecting the different varieties required by the mechanist. By RUFUS TYLER, *Mechanist.*

TO THE COMMITTEE ON PUBLICATIONS.

GENTLEMEN,—Estimating highly the importance to the practical mechanic and to science, of a mutual interchange of ideas and observations, through the medium of this Journal, I beg leave to offer for

your disposal, the following remarks, drawn from many years experience, relative to cast iron, and its application in the construction of machinery.

Formerly, mechanists experienced much difficulty in procuring iron castings of sufficient softness to admit of being worked with any facility, and even at the present day, the art of producing castings of any desired quality, is involved in some degree of obscurity. I shall endeavour, in my communication, to remove this obscurity, and thus to enable the founder to economise metal, and to assist mechanists in determining with readiness and accuracy, the fitness of any casting which may be offered to them.

It is usual to distinguish the hardest and softest kinds of cast iron, by the terms white and black, and all intermediate degrees by the term grey. The darker shades indicate the greater proportions of carbon which the material contains, and are most highly valued for melting, as a portion of this substance is unavoidably lost in that operation.

These indications, so far as the different shades of grey actually appear, may generally be relied upon for determining the quality of any article under examination; but circumstances incident to the casting, may cause each and all of them to assume the appearance and properties of the white variety, from which they cannot afterwards be distinguished, except by annealing, by remelting, or by chemical analysis. It is a mistake, therefore, to attribute to a deficiency of carbon, as is almost universally done, properties common to castings of every degree of carbonization; properties which will be found upon investigation, to depend upon *the particular arrangement of the particles*, assumed in passing from the fluid to the solid state, *determined by the length of time occupied in cooling, and by the proportion of carbon, conjointly.*

It is a fact, with which every workman in this material is familiarly acquainted, that opposite qualities are frequently exhibited in different parts of the same piece of casting. This is generally supposed to arise from an unequal distribution of the carbon, caused by the more rapid cooling of the thinner parts, which are always the first to assume the crystalline form. Hence it is the universal practice among founders, in making selections for melting, to break off and reject the hard parts, and to retain those which are soft for producing soft castings, and vice versa, for hard. In reality, every piece of cast iron, appearances to the contrary notwithstanding, is of the same composition throughout; and, further, it is only from such pieces as present both the hard and soft form, that an accurate knowledge can be obtained of the qualities of the material by inspection.

A knowledge of this fact, is of the utmost importance to founders, since under their present mistaken views, they are liable not only to undervalue much of their best material, because of its close resemblance to that which is inferior, but whenever this same supposed hard metal is employed for casting articles in which extreme hardness is a principal requisite, a disappointment necessarily results, except in

castings which happen to be as thin as those from which the selection for the furnace has been made. As it frequently happens that a charge is made up of both *real* and *supposed* hard iron, the result is seldom so totally at variance with what is expected, as in the case which I have just supposed. It is, however, in general sufficiently so to call forth the usual explanation, namely, that the metal has been improved, that is, has received an accession of carbon, in the furnace, although the reverse is known to take place generally, and to such an extent, that after metal of the softest quality has been remelted half a dozen times, it is no longer fit for any but the hardest castings; indeed, an allowance for this must always be made, particularly in the common air furnace, which hardens metal more than the cupola or blast furnace.

In attempting to produce extreme hardness, in thick masses, there is a difficulty in addition to that of the improper selection of metal. The high melting point of the metal, suitable for such purposes, produces this difficulty, which is further increased by the necessity of choosing from masses, as large, at least, as those which it is intended to produce. This, however, will not be regarded as an inconvenience, by those who are not aware that *hard* metal, in the form of thin scraps, may, or may not, produce hard castings, of larger, or rather of thicker, masses, at least by those who not having very powerful furnaces, reject large masses altogether. It is probably owing to this circumstance, together with the want of correct theory, that recourse is generally had to the artificial "chill," for hardening anvil faces, and many similar articles, thereby causing the metal to consolidate within the *hardening limit of time.*

By the employment of metal found to be truly hard, in pieces as large as can be conveniently managed, there will be no need of chilling any castings, smaller than those from which such selections have been made.

Some years ago, a notice went the rounds of the journals, of the discovery that hard cast iron, might be rendered quite soft by annealing in sugar.

I have before stated, that castings having different proportions of carbon, but resembling each other in being very hard, may be distinguished from each other by annealing; the fact is, that iron, highly carbonized, but hard from being chilled, or from being cast in very thin plates, may be softened by a simple annealing, and this may account for its working so *sweetly*, as your worthy Editor would say, after sugaring, as I did not find that experiment to succeed in a trial to which I subjected a piece of my own selecting.

Those who suppose that there is an unequal distribution of the carbon, in pieces which are soft and hard in spots, are answered by asking, what becomes of the carbon when a piece which would otherwise be grey and soft, is chilled in such a manner as to be rendered white and hard throughout, under circumstances which do not well admit the supposition, that the carbon has escaped? For instance, let a hole, half an inch in diameter, be drilled six or more inches deep, in a large block of brass, we must avoid cast iron, for that might

be said to absorb the carbon, and filled with melted iron. Now no one can doubt, that, in this case, the casting would be hardened through. It is necessary, therefore, to seek for some other theory than the one just mentioned, to account for this phenomenon. The one which I have adopted, as before stated, supposes, that whenever such a result takes place, it is due to circumstances in the *time of cooling;* in other words, that every piece of casting, whether white or grey, being remelted without changing the proportions of carbon and iron, will reproduce the same quality, if the time occupied in congealing be the same as before.

According to this theory, every different quality of cast iron, has *its own rate of cooling*, which determines the character it will assume. To illustrate this point, after I had long known the fact, I had a pattern made, consisting of two wedges, as nearly alike as possible; being about two inches wide, by three in length, and tapering from half an inch thick at the back to as thin an edge as could well be cast in the usual moulds of sand. These wedges were then connected at their backs by a piece as wide as one of the wedges, and about half an inch in thickness, in such a manner as to insure equality in moulding and casting in all respects: the edges being downward in the mould, caused them to fill, by pressure, very perfectly. From this pattern, or double wedge, I procured castings of various qualities of metal, from very soft, and highly carbonized, to that which was of a medium quality, (degree of carbonization,) and when broken diagonally across, one of the wedges of each pair from the edge towards the back, exhibited in the same fracture both the white and grey iron. In each, the white always commenced at the edge, and extended towards the back, where it met the grey, the transition being sudden, and tolerably well defined, but varying in *distance* from the edge, with the *shade* of grey, and thus furnishing a relative scale of measurement of the different qualities of the material.

This line of transition was found to follow very accurately the line of equal thickness, or, which is the same thing, of equal distance from the edge, across the wedge from side to side. The same appearance was exhibited by the other wedge of the pair, as was anticipated; and any number of similar wedges, cast under the same circumstances, of the same metal, whether connected or not, would exactly coincide, the time of cooling being the same in each.

From these facts, it is manifest that nothing more is necessary to enable one to determine the precise hardness of any casting, without defacing it, than to search out some thin wedge shaped part which may be broken off without injury; a wedge may be previously attached to the pattern, for the purpose, from any one of the castings made at the same time, of the same metal; and by noting the thickness at which the white form, passes into grey, having previous knowledge of the quality due to that thickness.

An exception to this rule, will be found in the last running of a heat, which is always harder than the first, the reason of which is, that the metal goes into the mould, at a temperature considerably

lower than at first, and consequently does not heat it to the same degree, and therefore the time of cooling of the metal, will be less for a given thickness.

Subsequently to the experiment before mentioned, I procured some pieces of different kinds of iron, cast from a pattern in the form of a cup, the rim of which was wedge shaped, instead of the double wedge, as being free from an objection which ought to have been mentioned in its proper place, to wit, that the edges being more exposed than the middle of the wedge, would cool sooner, and consequently remove the hardening point a little further up, making a slight variation in the line of transition, at those points.

It is probable, likewise, that these results would be slightly modified by another principle, which was indicated by the cast wedge; that in such forms as terminate every where by edges thicker than the hardening point, while portions are just inferior in thickness to that point, no hardening would take place; as the hard form, which is probably the result of crystallization, seems in this, as in other substances, to require some arrangement by which it may be commenced, and from which it will extend. Indeed, I have reason to believe, that where, from the nature of the furnace, or the metal employed, or from the acuteness of the angles in the pieces to be cast, danger is apprehended that the edges most exposed, will become hard for a small distance, that this result may be prevented entirely, by removing from the pattern these edges to *a less distance.* Such small portions may well be spared, even if recourse should afterwards be had to the file, or chisel, for restoring to the casting its proper form.

In the examination of a lot of castings at the foundry, care should be taken to avoid selecting such pieces, or parts, for breaking, as are likely to have had the rate of cooling affected by peculiar circumstances, such as the *gates,* (parts of which are either exposed to the atmosphere, or to sand immediately heated by the metal running over it,) or finny parts immediately in contact with large masses, which would cause them to remain longer in a fluid state. In this, there is seldom any difficulty, as there are generally to be found, for some days after any particular castings have been made, imperfect or damaged pieces, known to have been cast at the same time, upon which the examination can be made. Although wedge formed pieces, for reasons which must now be sufficiently obvious, are to be preferred, yet is often sufficient to examine the fracture of a piece of almost any shape, provided its time of cooling would be within that allowed to the thinnest portion of those to be determined; for the question, generally, is not, what is the precise quality, but whether castings are *soft enough* to admit of being worked.

Description of a Revolving Keeper Magnet, for producing Electrical Currents. *By* J. Saxton.

[Communicated by Professor A. D. Bache.]

Extract of a letter from J. Saxton of Philadelphia, now in London, to Isaiah Lukens, of Philadelphia.

"Since writing to you last, I have fitted up a magnet, which I believe produces much more powerful electrical effects than any other which has yet been made. It weighs five pounds and a quarter, and has a permanent power capable of supporting ten pounds. By the aid of this magnet, I can decompose water rapidly, and the shocks given to the tongue and mouth are so violent that few will take them a second time.

Fig. 1.

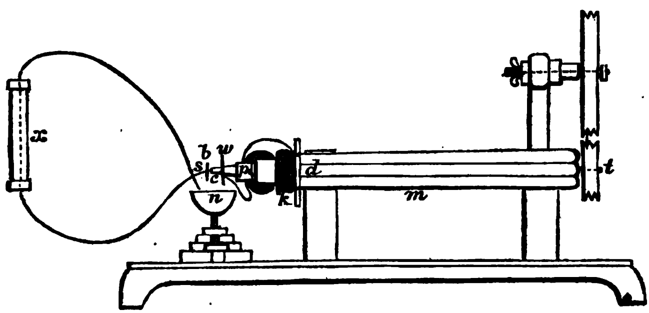


Fig. 2.

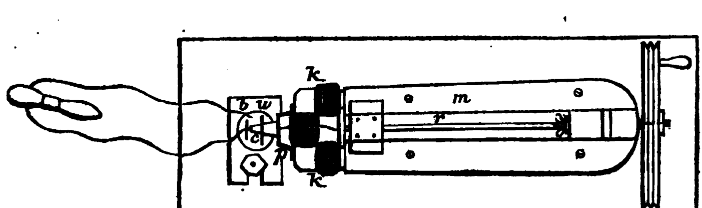


Fig. 3.

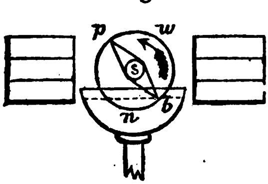
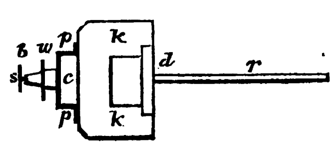


Fig. 4.



Of the accompanying figures, figure 1 is an elevation, and figure 2, a plan of the apparatus. In both figures, *m* represents the magnet; *k*, is the keeper, around which copper wire, wrapped with silk, is coiled; in the case above referred to, each of the three coils of wire contains eleven yards. The inner ends, or ends nearest the keeper, of the three coils, placed as shown in the figures, are united to a wire stem passing through a wooden cylinder *c*, firmly attached to the brass strap, or projection, *p*, which is screwed upon the keeper; upon the outer end of the stem *s*, fig. 3, screws a brass cross bar, a front view of which is shown at *b*. The outer ends of the same coils of wire, are soldered to a copper wheel *w*, fixed upon the wooden cylinder already described, which serves to insulate it from the copper stem *s*. The wheel *w*, dips into a wooden cup, *n*, (shown also in fig. 3,) containing mercury. [It is obvious that any electrical current in the wire will be continuous when the cross bar *b* (fig. 3,) dips into the mercury, and will be interrupted when the same bar leaves the mercury.] The proper position for the cross bar *b*, is that in which it is just leaving the mercury as the keeper arrives at the position in which its magnetism is neutralized. The keeper is made to revolve upon the ends of the magnet, and around its axis, by connecting it strongly by a brass disk *d*, with the rod *r*, turned by the wheel *t;* the velocity may be increased by the arangement shown in figs. 1 and 2, the two wheels being connected by a band or strap. The arrangement of the keeper with its strap *p*, of the wooden cylinder *c*, of the copper rod *s*, passing through its axis, and of the stem *r*, which serves to turn the keeper, are most fully shown in fig. 4; the keeper is represented without the wire upon it.

"The arrangement for decomposing water is shown in fig. 1. *x*, is a small glass tube, into each end of which is inserted a cork, having a fine platinum wire passing through the middle of it; the inner ends of the two wires are brought within about one-tenth of an inch of each other, the outer ends are soldered to copper wires, one of which passes into the mercury of the cup *n*, and the other is applied to the cross bar *b*. On turning the machine, gas will be seen to rise from each of the wires.

Attached to fig. 2, is the apparatus for communicating shocks to the tongue. It consists of two small plates of metal, fastened to a wooden handle; to each plate a wire is soldered, one dipping in the mercury of thc cup *n*, and the other being applied to the cross bar *b*. On placing the tongue between the two plates, and turning the machine, a rapid succession of shocks is produced. With the machine thus described, the needle of a galvanometer was made to stand steadily at right angles to the magnetic meridian, showing a perfect current."

Two machines, similar to those just described, have been made by Mr. Lukens, one for Prof. Patterson, of the University of Virginia, the other for the University of Pennsylvania.*

* Since the above has been in type, Mr. Lukens has completed several similar machines, improving the mechanical arrangement, by substituting toothed wheels for the wheel and band shown in the figures.

Notes of an Observer.

On Final Causes.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

One of the most remarkable mistakes which can be found in the annals of science, could not have been committed, if the author had been a believer in final causes; for such a belief would have led to the suspicion that something had been overlooked in a calculation which led to the conclusion, that the moon might have been better arranged for the accommodation of man.

The reader will find the passage to which I allude in the second volume of Laplace's System of the World, as translated by Mr. Pond, page 94.

The illustrious author, after a most profound investigation, in which he demonstrates, what had escaped even the penetrating eye of Newton, that the acceleration of the moon's motion is caused by the diminution of the eccentricity of the earth's orbit, steps, as I conceive, out of his way to introduce the following remarkable paragraph.

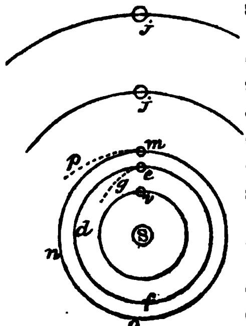
"Some partisans of final causes have imagined, that the moon was given to the earth to afford it light in the absence of the sun. But in this case, nature would not have attained the end proposed, since we are often deprived at the same time of the light of each of them. To have accomplished this end, it would have been sufficient to have placed the moon at first in opposition to the sun in the plane of the ecliptic, at a distance from the earth equal to one hundredth part of the distance of the earth from the sun, and to have given to the earth, and to the moon, velocities parallel and proportional to their distances from the sun. In this case, the moon being constantly in opposition to the sun, would have described round it an ellipse, similar to that of the earth; these two bodies would thus have succeeded each other above the horizon, and as, at this distance, the moon would not be eclipsed, its light would always replace that of the sun."

Now, it cannot be denied, that there is some point to which if the moon were removed, and projected with a velocity greater than that of the earth, in proportion to its greater distance, as proposed by the author, *if there were no bodies in the universe but the sun, the earth, and the moon*, the result would be, that the moon would go round the sun in the same time as the earth, always rising as the sun sets. But the equilibrium would be like that of a needle balanced on its point, and could not exist a moment, if any fourth body, such as another planet, is supposed to act. Now it can hardly be supposed, that the author meant, that the arrangement here spoken of, might have been made at the expense of having no other bodies in the universe; and yet, without this, the arrangement proposed could not exist.

The reader may easily perceive the truth of this assertion, by considering the effect which either Venus or Mars would have on approaching the moon and earth, under the proposed circumstances.

In the adjacent figure, let *v* be Venus, *e* the earth, *m* the moon,

and *j* Jupiter, or Mars, in their respective orbits, moving round the sun S, from right to left.



Now, it is manifest, that if the moon and earth are so adjusted as to move in their orbits *m*, *n*, *o*, and *e*, *d*, *f*, without the influence of Jupiter, or Venus, when these planets come to act at *j* and *v*, the earth and moon will separate from each other, and the earth will begin to move in a curve within her former orbit, as *e g*, and the moon will begin to move in a curve without her former orbit, as *m p*.

It remains now to show that the equilibrium can never be restored, and that the moon and earth will continue to separate from each other, until they finally perform orbits as independent of each other as of the other planets. This will appear from the single consideration, that the moment they begin to separate, the earth will begin to move faster, and the moon slower, than before, not only because their influence on each other is diminished by their greater distance from each other, but from the universal principle, that all the planets increase in velocity when approaching the sun, and decrease in velocity as they recede from him, and it is manifest that the farther they recede from each other, the less will be their tendency to return. It would not be difficult to calculate the periodical times of the earth and moon in their new orbits; but at present it will be sufficient to make the obvious remark, that the point where they begin to separate will be the aphelion of the earth, and the perihelion of the moon, provided they had been moving in circular orbits before.

This last statement needs no demonstration, to any one at all familiar with the laws of planetary motion.

Indeed, the whole subject is so simple and elementary, that if I could affix any other meaning to the paragraph quoted above, than that which the words naturally convey, I should suppose the author did not mean what he seems to say: for it appears to me almost impossible that so obvious a mistake could have been made by the first mathematician and astronomer of his age. No other meaning, however, occurring to my mind, nor to any of my friends to whom I have shown the passage, I have thought it my duty to notice it to the public, more particularly as it seems to be levelled against final causes, a subject near to my heart.

What is most remarkable in the matter is, that the distance assigned by the illustrious author as that at which the moon should be placed from the earth, is quite too small; for instead of one hundredth, it should be between $\frac{1}{69\cdot2}$ and $\frac{1}{69\cdot3}$, if the quantity of matter in the moon and earth together, is one 332200th part of the quantity of matter in the sun.

Suppose, for the sake of simplifying the calculation, as the result is the same, that one half the matter of the moon and earth is in the earth, and the other half in the moon, so that the centre of gravity of the two bodies may be half way between them.

Now, let the moon be one hundredth of the distance of the sun from the earth, according to the supposition of our author; if it goes round the sun in the same time as the earth, it must fall below a tangent to its orbit one hundredth faster than the earth, that is one 200th faster than a body moving round the sun at the centre of gravity between the moon and the earth.

Therefore, the attraction of the earth for the moon in these circumstances, would have to be one two-hundredth of the attraction of the sun for a body at the centre of gravity between the moon and earth; but calculating its attraction according to the direct ratio of its quantity of matter, and the inverse ratio of the square of the distance, I find the quantity about $3\frac{1}{4}$ times greater, consequently the moon would fall below the tangent to her orbit too fast to remain at the same distance from the earth and sun.

By calculating on similar principles it will be found that the true distance is greater than $\frac{1}{69 \cdot 3}$, and less than $\frac{1}{69 \cdot 2}$.

In conclusion, perhaps I may be permitted to say, as an apology for not having pointed out this error when I might have so done, before the death of the illustrious author, that the substance of this paper was communicated to the American Philosophical Society more than ten years ago. It has not, however, appeared in their transactions, and, so far as I know, the error has not been noticed by any other writer.

Should I be wrong, there are a thousand able pens ready to vindicate the accuracy of the illustrious dead.

FRANKLIN INSTITUTE.

Monthly Meeting for Conversation on Mechanical Subjects.

Saxton's revolving keeper magnet,* for producing electrical currents, was explained by Prof. A. D. Bache. The apparatus was made by Lukens, for the University of Pennsylvania. By means of it, a rapid succession of brilliant sparks was obtained, and shocks communicated to the tongue.

Mr. Rufus Tyler, showed the combustion of fine steel turnings in the open air. A portion of the turnings were sufficiently fine to burn rapidly when one part of them was heated by the flame of a candle. The coarser kinds were burned by first exposing them to the flame of the blow-pipe, and then blowing upon them from the lungs, or moving them through the air. The heat evolved in the combustion of the turnings is sufficient to enable them to raise the temperature of the whole to the degree required for combustion. Prof. Bache stated, that Mr. Tyler had, by the heat afforded by steel filings as a fuel, turn over the end of a bar of iron, and welded it completely when turned. The fire was first made by charcoal on a blacksmith's forge, a cylinder placed over the blast pipe from the bellows, and the steel turnings added at intervals.

* See page 155 of the present number of the Journal.

Mr. M. W. Baldwin gave an account of a method which he had employed for renewing files, by covering the projecting parts with a light etching ground, and immersing the file in diluted acid; the cavities are thus attacked, and the prominences increased. The removal of the etching ground, and immersion in an acid, sharpens the teeth thus raised.

A letter from Mr. Thos. Ewbank, of New York, was read, accompanying specimens of different parts of the boilers of the steam-boat New England, which exploded in November last. The specimens were placed upon the table for examination. They were transmitted by Mr. Ewbank to the committee on explosions, to test the relative strengths of the specimens from different situations in the boiler.

P. B. Goddard, M. D., explained the principle of a very simple and efficient stomach pump, invented by him. An account of this, with the cut required for its explanation, will, it is expected, be laid before the readers of the Journal.

REPORT OF THE COMMITTEE ON WEIGHTS AND MEASURES.

Appendix to the Report of the Committee of the Franklin Institute on Weights and Measures.

Report giving an account of the System of Weights and Measures of France. By T. M'Euen, M. D.

The system of weights and measures in France, with the legislation respecting it, has been so ably treated by the late President John Q. Adams, that a reference to his report would fully answer the purpose of the committee. As it was, however, necessary to present to the committee the most important facts connected with this philosophical system, I have endeavoured to do so in a condensed form. A few extracts from the report of Mr. Bonne will serve to show in what confusion the subject was involved before the adoption of the *metrical system.*

The Roman pound, $\frac{2}{3}$ of the Mark pound very nearly, (8oz. Boyer) was in use in France until the age of Charlemagne, who introduced a pound of 12oz. Mark, divided into 20 sous and 240 deniers, which was employed till the reign of Philip I. who fixed the Mark at $\frac{2}{3}$ of the pound of Charlemagne. During feudal times the confusion of weights and measures became great. From that time the evil has been increasing, and efforts have been lately (1790) made to obtain a simple standard.

Monton has proposed the third of a degree of the meridian.

Bouguer, the pendulum vibrating in seconds.

La Condamine, one of its parts.

Pancton, the Egyptian foot which is half a cubit of the Nilometer.

Collignon, the billionth part of a great circle.

The Equatorial foot, obtained from the circumference of the earth at the equator, by observing the movements of the sun, moon, and a

star, is the base of a system offered to the National Assembly by Mr. Bonne in 1790.

This foot.=14 inches Eng. very nearly.

The English foot,= $\frac{6}{7}$ths of an Equatorial ft.=11 in. 3 lines, 2.4 points Paris measure. It is also equal to the foot of Macedonia, those of Urbino and Pesaro, the half arschine of Russia.

The cubit of the Nilometer=1.824ft. English=1ft. 8in. 6lines 5pts. Paris is to the Equat. ft. as 25 to 16, this relation being expressed by complete squares, these two measures will be in the ratio of the lengths of two pendulums which may be easily compared together.

It is divided into 16 digits or 12 inches, of which the ancient Roman foot=10 inches, the Palm now used by the Roman architects =10 digits.

From the measures in use based on this foot as the original standard, some of the most convenient may be chosen; for example, the ell of Bayonne is $2\frac{1}{2}$ft. Equat.

If it were longer it would be inconvenient, as for instance with the Ell of Laval nearly 4ft. Equat. the canne of Toulouse, that of Montauban and of Nozai=5ft. Equat. These measures are so long that a single individual cannot use them with convenience.

Measures of capacity, dry and liquid.—The Equat. ft. being 13in. 1li. $8\frac{55}{71}$ pts. in length, its cube is $2270\frac{24}{25}$ cubic inches. Following the example of the ancients, this is taken for the medimne or minot of grain.

An equal bulk of pure water would weigh $91\frac{43}{45}$lb. mark at $15\frac{1}{4}$ Reaumur, and of wheat would weigh $70\frac{21}{22}$lb.

Pure water is preferable to all other liquids for the purpose of a standard; it is always to be obtained, and is one of the most homogeneous of liquids: besides, it dilates very slightly at the temperature just referred to.

Moreover, the peculiarities of this fluid have been ascertained by very nice experiments, reduced to the mean height of the barometer ($2\frac{10}{29}$ft. Paris), at the level of the sea, in 45 degrees of Latitude, eight times the Equat. ft. would constitute the tun for wine and liquor, it would be the cube of two feet, weighing when filled with pure water $735\frac{2}{3}$ lbs., and containing $378\frac{1}{2}$ pints, Paris measure.

The Equat. cubic foot is also the bushel of water in English measure, and the wiertel of Arnstadt in Thuringia. The mesare of Besançon is one half of this minot; it will be subdivided like the tun, into halves, thirds, quarters, sixths and eighths.

An eighth will be the *quarte*, or quarter, of the bushel; this filled with pure water will weigh $11\frac{45}{91}$ lbs. mark, and with wheat $8\frac{13}{15}$lb.—thus half of the minot for grain will be the bushel, because it is the mean of all the measures of the same kind in France.

The thirds, sixths and twelfths have been proposed, because they correspond with many measures now in use; but if the smaller divisions are by halves, quarters and eighths, the former will be less necessary, as grain is not so valuable as to render very small measures necessary. The Equat. foot will also be the basis of liquid measures;

the mode of deriving the tun from it has been already shown. This foot will be the *metrète* or *amphora*, divided as we have already done the *minot*. The eighth will be the *velte* divided into thirds, sixths, and twelfths.

The eighth of the velte of pure water will weigh 1$\frac{4}{9}\frac{1}{3}$lb. mark, this will be the *chopine* of which the double—the pinte will be preferred only because it corresponds with the mean of all the measures of the same denomination throughout the kingdom.

I proceed next to an analysis of the report on the measure of the meridian in France, and the results deduced from it, to determine the basis of the new system of measures, made to the National Institute of France, in the name of the class of Mathematical and Physical Sciences.

In pursuance of a proposition made by Talleyrand to the *Assemblée Constituante*, the Academy of Sciences was directed to decide upon a basis for a system of weights and measures.

The Academy named for this purpose, a committee, consisting of Messrs. Borda, Laplace, Lagrange, Monge and Condorcet; who reported the 19th March, 1791. In this report three methods for obtaining an invariable standard, are discussed.

1st, the length of a *pendulum*, 2nd, a *fourth part* of the *equator* of the earth, 3d. a *fourth part* of a *terrestrial meridian*.

The committee gave preference over other pendulums to that vibrating seconds in lat. 45°.

It must be observed that there enters into computations based on this instrument, a heterogeneous element, which is time, and an arbitrary one, viz: the division of the day into twenty-four hours, or 86400 seconds.

The other two proposed bases are not liable to this objection, as they depend only on linear extension; they have another advantage, which is, that being taken from the surface of the earth, they correspond to the use made of them for the common purposes of life. For instance, the measures of the distance between two points on the earth's surface, or the extent of a certain portion of that surface. It is certainly much more natural to compare the distance between any two places, to a part of a terrestrial circle, than to the length of a pendulum.

The relative advantages of a quarter of a meridian and of the same portion of the equator are now to be examined.

The regularity of the equatorial circle, and the regularity or correspondence of the degrees of the meridian are equally doubtful: but a circle corresponding with the equator is not very susceptible of being measured with accuracy. It may be said with truth that every nation of the earth has its meridian, while but few live at the equator: the operations necessary to determine exactly the equatorial circle, require to be carried on in countries remote from civilization, and the expense and difficulty would surpass the advantage to be derived from them. This would be the case, as well in the first observations, as in those that might become necessary to verify the results obtained. A fourth part of a degree of the meri-

dian is, therefore, to be preferred; a ten millionth part of this extent will be assumed for the ordinary unit of measure.

The customary division of the meridian into degrees, minutes, and seconds, is abandoned, because the decimal division corresponding with an arithmetical scale is more readily applicable to common use; and the inconvenience of two systems of division would be without end.

On the other hand, the difficulty of a change is temporary, and will fall on a few persons, accustomed to calculation: the perfection of the operation should not be sacrificed to considerations, which, in many respects, appear to the committee to be personal.

In adopting these principles, nothing arbitary enters into the measures but the arithmetical scale by which they are divided. And with regard to weights, the choice of a substance homogeneous and at all times easily procured equally pure and dense, to serve as a standard, is the only thing assumed arbitrarily.

To fulfil these conditions we propose distilled water, in vacuo, or reduced to the weight it would have in that situation, and at the temperature at which it passes from the solid to the fluid state.

It is therefore proposed to measure, as soon as practicable, an arc of the meridian from Dunkirk to Barcelona, comprehending a little more than nine and a half degrees. This extent is quite sufficient, and it embraces about six degrees to the north and 3½ to the south of the mean parallel of latitude. To these advantages, is added that of having the two extremities at the level of the sea, points invariably fixed by nature. By extending the line beyond the Pyrenees, all uncertainty as to the influence which these mountains may exercise on the instruments employed, will be avoided.

The operations necessary for this purpose are, 1st, to determine the difference of latitude between Dunkirk and Barcelona, and to make, on this line, all the astronomical observations which may be thought useful.

2nd. To measure the old bases employed in the measure of a degree made at Paris, and in the construction of the map of France.

3d, To verify, by new observations, the series of triangles used in measuring the meridian, and to prolong it to Barcelona.

4h, To make at the forty-fifth degree of north latitude, observations to determine the number of vibrations made in a day, in vacuo, by a simple pendulum, at the level of the sea, and at the temperature of melting ice, the simple pendulum to be equal to the ten millionth part of an arc of the meridian; the number of these vibrations being known, the standard of measure may be formed again at any time by observations of the pendulum. By this plan are combined the advantages of the system adopted, and of those that would arise from assuming the length of the pendulum as the unit of length.

The observations on the pendulum may be made before the ten millionth of the arc is ascertained: as, when the number of vibrations of a pendulum of a given length is known, it will be sufficien for deducing the number sought, to compare the known length of the pendulum to the ten millionth part of the arc.

5th, To ascertain by new and careful experiments, the weight in vacuo of a given bulk of distilled water at the temperature of melting ice.

6th, To compare together the different measures of length, surface or capacity, and the weights used in commerce, in order to find eventually their corresponding values in the new measures and weights, when these shall have been determined.

This report was adopted by the Academy, and presented to the National Assembly; by which body measures were taken for carrying the project into effect.

The Academy was authorized to appoint committees for each of the proposed investigations. This was immediately done; and the selecting and preparing instruments, was the preliminary step taken.

The successful use of the repeating circle of Borda in measuring the distance between Paris and Greenwich, in 1787, the facility with which it is applied to taking altitudes, and its small dimensions, proved that it might be used to replace other larger instruments.

Four were constructed by Lenoir, with a radius somewhat longer than that of the instrument used in 1787 (which was 14 inches.)

The same artist made the platinum rules used in measuring the bases, another platinum rule for observations on the pendulum, and two spheres, one of gold, the other of platinum, for the same purpose.

The rules of platinum for measuring the bases were twice the toise of Peru (i. e. 12 feet French) in length, having a strip of copper on the upper surface to serve as a thermometer, placed upon a support of wood and protected by a roof; there were four of them, numbered one, two, three, and four. When used they were not in contact, but placed near each other, and the distance between them measured by a slip of platinum graduated so as to form a vernier.

The measure of the meridian was made by Messrs. Mechain and Delambre, the latter, that portion between Dunkirk and Rhodez: Mechain, whose operations were between the last named point and Barcelona, was prevented by death from extending the line to the Island of Cubrira, as he had intended. This intention was afterwards carried into effect by Messrs. Biot and Arago.

Two bases, one between Melun and Lieusaint, 6075.90 toises, the other between Vernet and Salies, 6006.25 toises, were measured by Delambre: each about 7 miles.

The latitude of the several points was observed by the same gentlemen.

It is unnecessary to enter into the minute detail of these operations, they were made with the most scrupulous nicety: the results were examined by a number of scientific men of several nations, invited by the French government to constitute a part of the committee on weights and measures. They afford all the data necessary for determining the base of the new metric system; and in addition give rise to some very interesting questions on the form of the earth.

The arc of the meridian between Dunkirk and Montjouy subtends

a celestial arc of $9\frac{6738}{10000}$ degrees; its length is $275,792\frac{36}{100}$ modules, about 650 miles. From this base a fourth part of the meridian has been deduced by strict calculations; the flattening of the earth toward the poles being determined from the above measure and others made in different parts of the world, to be $\frac{1}{334}$th of the diameter at the equator.

The fourth part of the terrestrial meridian is found to be 2,565,370 modules; and as a final result, its ten millionth part, or the *metre*, the unit of length is $\frac{256,537}{1,000,000}$ of the module, or 3 ft. 11 lines of the toise of Peru, at 13° Reaumur, equal, according to the Academy, to 39.3827 inches English; according to Capt. Kater, to 39.39079; according to Mr. Hassler, to 39.3802 inches.*

The measures of length are	$\frac{1}{100}$th. of a metre		or	Centimetre.
	$\frac{1}{10}$th.	„	„	Decimetre.
			„	Metre.
	10 metres	„	„	Decametre.
	100 „	„	„	Hectometre.
	1000 „		„	Kilometre.
	10,000 „		„	Myriametre.

The measure of surface is the *arc* = 10 metres square; and the *stère* is a solid measure the content of which is a cubic metre.

The determination of the unity of weight was made by Lefevre Gineau and Fabbroni, with equal care and skill.

The points to be decided previously to an experimental inquiry, are; 1st, to fix on the volume to serve as a standard of comparison.

2nd, the choice of a proper substance.

3d, to ascertain the weight, or the quantity of matter, which the substance contains in a given volume.

The volume may be taken arbitrarily, but convenience requires that it should be moderate, and the decimal system that it should be expressed by a cubic number, which is at the same time a decimal submultiple of the metre.

The Academy therefore adopted the thousandth part of the cube of the metre, or, what is the same thing, the cube of the decimetre. They also made choice of water, for the substance of which the weight of a cubic decimetre should be the unit of weight.

This substance, remaining fluid at a temperature easily obta

* As the flattening of the earth's surface towards the pole is not exactly known, the following table shows the difference in length of the metre: when the flattening is,

$\frac{1}{150}$	443.25370
$\frac{1}{200}$	443.24980
$\frac{1}{250}$	443.24854
$\frac{1}{300}$	443.24817
$\frac{1}{310}$	443.24814
$\frac{1}{320}$	443.24812
$\frac{1}{330}$	443.24811
Sphere	443.25171

every where; being of such a density, that accurate experiments may be made in it without difficulty; and above all, being easily obtained in a state of purity, is more appropriate than any other for the purpose in view.

The method which naturally presents itself of determining this weight, that of filling with distilled water a vessel of which the sides are decimetres, and weighing it, offers so little hope of accuracy that it cannot be adopted. Recourse must obviously be had to the principle in Hydrostatics, that the weight of any fluid contained in a given volume, is equal to the weight which that volume loses by immersion in the fluid.

But the experiment in confirmation of the principle which ordinarily appears to be so easy and simple, is singularly difficult, when it is made with a view to determine an absolute quantity; great precision is required, in ascertaining the volume of the body employed, and in weighing it in the air and in the water: reductions are also to be made for the weight and temperature of the air.

To fulfil these conditions, a hollow cylinder of brass, the form most easily made regular, of which the diameter was about equal to the height, and the volume something more than eleven cubic decimetres was constructed. Its sides within, were so sustained that no change of form could take place when it was immersed in water. Notwithstanding the care taken in making this cylinder, it was found to be not quite perfect; it became necessary, therefore, to find its dimensions by the nicest measurement; the exact solid content was 0.0112900054 cubic metre, or 11.29 cubic decimetres.

Weights of brass divided decimally and strictly compared, were used; and the balance employed, was, when loaded with two pounds mark in each dish, sensible to the millionth part of that weight. In weighing the cylinder, it was placed in one of the dishes, and counterbalanced, it was then removed and the weights put into the same dish.

The mean of fifty-three trials, differing in the extremes only by 45 millionth parts, gave as the true weight of the cylinder $11\frac{466}{1000}$ units, and as the counterpoise was of the same substance with the material weighed, the weight in air was exactly what it would have been in vacuo.

In ascertaining the weight in water many other circumstances were to be considered. The mean of thirty-six trials, in which the greatest difference amounted to but 45 millionth parts, gave very nearly $\frac{209}{1000}$ths. of the unit, (exactly 0.2094190) for the apparent weight.

The following allowances were made to obtain the true weight.

1st. The air sustains the weight employed, and not the cylinder which is immersed in water, therefore the weight of a volume of air equal to the bulk of the weights employed, is to be deducted.

2nd. As the cylinder is hollow, the weight of the air contained in the cavity is also to be deducted.

3d. The temperature of melting ice had been assumed for the state of density of the water; it was however found impracticable to re-

duce the temperature below two-tenths of a degree of the centigrade scale; and the mean temperature of the water during the experiments was three tenths.

The experiments of De Luc rendered it probable that the point of greatest density of water was about 5° *centigrade*. New experiments were made to obtain exact results, from which it appeared that the point of greatest density of water is a little above 4° *Cent.* = 39.2° Fahrenheit. A highly important fact, affording a point of density which is invariable, and being the only instance of the kind in a liquid.

The committee determined to employ it, and to deduct $\frac{144}{1000000}$ths. of the unit from the apparent weight, this being the difference between the weight lost by the cylinder when weighed in water at $\frac{3}{10}$ths. of a degree *Cent*, and that lost when the water is at its maximum density.

With these allowances the weight of the cylinder in distilled water at its maximum density was $\frac{195}{1000}$ths.

Two other circumstances are to be considered, the weight in air was taken at the temperature of 17½° that in water at $\frac{3}{10}$°; the contraction of the brass is therefore to be allowed for, according to the result of experiments instituted to ascertain the rate of expansion in brass by increase of temperature.

Again, a small excess of volume arises from the tube of brass by which the cylinder was suspended, these farther reductions bring the true volume to 11.27 cubic decimetres, which is the volume of water weighing 11.27 units.

Whence a cubic decimetre of water at its greatest density weighs $\frac{999}{1000}$ths. of the unit, which is the Kilogramme of the new metric system.

The relation of the arbitrary weight we have called the unit, to the old weights, remains to be considered; for this purpose a comparison was made between it and the "pile de Charlemagne," and it was found that the fifty marks which constitute the pile were equal to 12.227944 units of the weight employed. Its unit was, therefore, equal to 18842.088025 grains mark.

Whence it results that the true Kilogramme or the cubic Decimetre of distilled water at maximum density, weighs, in vacuo, 18827.15 grains mark; or 1644.579 grains English.

The weights are, the	Kilogramme,	divided into	1000 grammes.
	Hectogramme	"	100 grammes.
	Decagramme	"	10 grammes.
	Gramme		Unit.
	Decigramme		$\frac{1}{10}$th. gramme.
	Centigramme		$\frac{1}{100}$th. gramme.
	Millegramme		$\frac{1}{1000}$th. gramme.

The measures of capacity are likewise based on the metre, they are, the

Decalitre	=	10 metres.
Hectolitre	=	100 „
Kiliolitre	=	1000 „
Centilitre	=	$\frac{1}{100}$th metre.
Decilitre	=	$\frac{1}{10}$ th „
Litre	=	cubic metre.

The standards prepared by the committee were, for measures of length:

A Platinum metre to be deposited with the Corps Legislatif, to be preserved with the greatest care, and to be used only on the most important occasions.

For ordinary adjustments there were prepared with the same care and precautions, metres of iron, corresponding exactly with each other, and at the temperature of melting ice, with the platinum standard. The ends of these iron metres are preserved from wearing by projections of brass.

As however different metals expand unequally by the same change of temperature, convenience requires that the ordinary standards should be made at 10° or 15° *Cent*; because a change of 10° above or below that temperature will produce a variation of but $\frac{3}{100}$ths. of a millimetre between a metre of iron and one of platinum, and of $\frac{6}{100}$ths. of a millimetre when the metres compared are of brass and iron.

The standards of weight were also a Kilogramme, one of platinum, to be preserved by the Legislature, and several of brass, all exactly equal, to be used as standards for common use.

It is to be observed that the platinum standard when weighed in the air would be heavier than those of brass, by $1\frac{2}{3}$gr. and that this difference, arising from the greater density of the platinum, renders it unfit to be used as an ordinary standard.

Experiments for ascertaining the length of a pendulum vibrating seconds at Paris were made by Messrs. Borda and Cassini; the follow- is an outline of their operations.

The experiments were made on the ground floor of the observatory at Paris: the apparatus made use of was attached to a wall of 12 feet high, 8 feet wide, and 2 feet thick. The instruments consisted of a time-piece beating seconds, with which the vibrations of the pendulum were compared; the pendulum fell a little in front of that of the clock, and was suspended from a mass of stone, containing about three cubic feet, placed on the top of the wall.

The weight of the pendulum vibrated at about the height of the bob, and its oscillations were observed through a small telescope at the distance of six feet. The whole apparatus was protected by a case, glazed in front.

The pendulum was supported by a knife edge, and to remedy the weight added to the pendulum, the suspension itself constituted a small pendulum, of which the motions were synchronous with those of the pendulum used for the experiment. So that the centre of

motion may be supposed to be on the plane on which the knife edge moved.

The plane was of hardened steel; to the knife edge was attached an iron wire, which, with the sphere to be described, constituted a pendulum twelve feet long, making a vibration in two seconds: this was preferred to the seconds pendulum, because, as it is four times as long as the last, any error, in measuring the length, would have but one fourth of the effect on the longer one.

The oscillating body was a sphere of platinum of $16\frac{1}{6}$ lines in diameter, weighing 9911 grains, and of the specific gravity of 20.71 at 20° cent.

The wire was attached to the sphere by means of a copper cap, the lower part of which was concave and corresponded with the surface of the sphere.

A thin coating of tallow between the sphere and the cap, pro duced sufficient adhesion to support the weight; and by these means the sphere could be suspended by different portions of its surface, so as to correct errors arising from unequal density, or want of sphericity.

The length of the pendulum was such that its oscillations were not quite so long as two of those of the clock. The comparison of the pendulums was made when they were both arriving at the vertical, being the time of most rapid motion: a black screen was placed a little in front, the edge of which coincided with the centre of the wire of the pendulums, and with diagonal cross lines on the pendulum-bob of the clock, when they were at rest.

The two pendulums, thus arranged, being set in motion, if the wire disappeared before the cross-lines and the pendulum of the clock made rather more than two oscillations while the pendulum was making one, the interval of time between the disappearance of the two became constantly less; and finally the two objects passed the edge of the screen together. This was the first coincidence. Soon afterwards the oscillations no longer agreed; the clock gaining on the pendulum; after some time another coincidence took place; and the coincidences were observed until the oscillations became so small as to be uncertain.

The oscillations of the pendulum continued for more than twelve hours, but, for the reason above given, the observations were continued but four or five, a length of time amply sufficient to ascertain the relative movements of the pendulum and clock. In fact, when the interval between the coincidences was fifty minutes and the oscillations not too small, the uncertainty, as to the time when the coincidence took place, was not, at most, over thirty seconds, which indicates that the discordance was perceptible when one of the objects arrived at the perpendicular $\frac{1}{50}$th of a second before the other. Whence the duration of the experiment being 4 hours, the rate of the pendulum was determined to the *three hundred and sixty thousandth part.*

The rule used for ascertaining the length of the pendulum was about 12 feet long, of platinum, covered with another of copper of

about $11\frac{1}{2}$ft. long: the two forming a metallic thermometer of which the indications were read on a vernier at the lower part.

At the upper part of the rule of platinum was a cross bar of steel to lie on the horizontal plane, on which the knife edge of the pendulum was placed; the rule was so arranged that when it was in the place of the pendulum its upper end was exactly in the plane of suspension.

At the lower end of the platinum rule, was a slip of the same metal, moving with a little resistance in a rebate, and on this slip were divisions constituting a vernier indicating 200 thousandths of the whole rule.

Another instrument, used in measuring the pendulum, remains to be mentioned. It was a plate of copper placed immediately under the sphere of the pendulum, and attached to a stone projecting from the wall. This plate, which was horizontal, could be elevated and depressed by means of a screw, with a very fine thread.

After an observation with the pendulum was concluded, it was set at rest, and the copper plate carefully elevated till it just touched the lower part of the sphere: the pendulum was then removed, and the rule put in its place. The slip bearing the vernier was then advanced till it touched the copper plate, and thus gave the length of the pendulum from the point of suspension to the lowest part of the sphere. The centre of oscillation of a sphere around a point being $\frac{2}{5}$ths. of the square of the radius divided by the distance of the point of suspension from the centre, its position was known.

Twenty experiments, similar to that described, were made with the greatest care; the results being corrected for the temperature, barometric pressure, varying length of arcs, and in fact, every circumstance that could be supposed to exert any influence: it appears that when each result was compared with the mean result, the greatest difference was but 134 thousandths. Corresponding with one 300th. of a line in the deduced length of the pendulum, vibrating seconds.

Consequently the length of the pendulum, vibrating seconds, in Paris, is equal to 50999.75 parts of the rule, each part being one two-hundred thousandth of the whole rule.

The rule was compared with that numbered (1), used in measuring the bases for the determination of the terrestrial arc. The length of the pendulum was found to be equal to the fraction 0.2549919 of the rule No. 1. at the temperature of melting ice.

By a comparison of this measure with the toise used in former comparisons, it was found that the length of the Pendulum vibrating seconds, is, in lines of that toise=440.5593 lines=0.7418875 metres =29.12166584 English inches; found afterwards by Biot and Arago 0.7419012 metres, or $\frac{14}{1000}$ millimetres less.—The mean being 0.7418943.

Reduced to the level of the ocean, in North lat. 48° 50′ 14″ =0.7419176.

Length of the pendulum at the level of the sea at

Uns	60° 45′ 25″	N. lat.	742.723	Biot.
Fort of Leith	55° 38′ 37″	,,	742.413	Biot.
Dunkirk	51° 2′ 10″	,,	742.077	Mathieu, Biot.
Paris	48° 50′ 14″	,,	741.917	Bouvard, Mathieu, Biot.
Clermont	45° 46 48″	,,	741.705	Mathieu, Biot.
Bordeaux	44° 50′ 26″	,,	741.608	Mathieu, Biot.
Figeac	44° 36′ 45″	,,	741.612	Mathieu, Biot.
Formentera	38° 39′ 56″	,,	741.252	Arago, Chaix, Biot.

If the earth were elliptic, the length of the simple pendulum would vary as the square of the sine of the latitude.

The difference, or irregularity of the degrees measured is still unexplained. It does not seem to arise from error in the observations, as it is corroborated by the results of different persons, in different places. It is very great, if attributed to local causes. It is still an unsolved problem.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN SEPTEMBER, 1833.

With Remarks and Exemplifications, by the Editor.

1. For a *Machine for Setting Carriage Springs;* David C. Andrews, Westmoreland, Oneida county, New York, September 6.

This machine consists, in part, of two rollers, fixed horizontally in a frame, like flatting mill rollers; the uppermost moves up and down in slots made in the uprights for that purpose, so that it may advance towards, or recede from, the lower roller. A piece of metal, called a driver, fits over the top of the roller frame in such a way that its two ends bear upon the gudgeons of the upper roller; and a weighted lever crosses the top of the driver, to press this roller downwards with any required degree of force, a second lever being employed to raise this when necessary, acting in the manner of the combined levers commonly used for pressing upon the drill stock in drilling iron at the vice.

When springs of any kind are to be set, such as horizontal, eliptical, cradle, or C springs, the first plate, or leaf, is to be bent into the required form, and cooled; the second leaf, heated, is then to be laid upon this, and the two passed together between the rollers, the lower of which is to be turned backward and forward by means of a crank, after which the other half is to be heated, and treated in the same way. All the leaves of which the spring is to consist, are to be successively set in this manner. A groove is left in the upper roller, to receive the button upon the spring; and there are to be vertical friction rollers on the inside of the frame, to prevent the springs from coming into contact with it.

There is no claim made, and as, so far as we are informed, no similar

machine has ever been used for the purpose of setting springs, the omission may not be a thing of much moment. We see no reason why this instrument should not effectually accomplish the end proposed, and save much labour.

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2. For a machine to be used as a *Blacksmith's Striker;* Lewis Stipe, Stokes county, North Carolina, September 6.

Machines are intended, in general, to lessen human labour, or to transform time into power, so that effects may be produced by ordinary exertion, which it could not otherwise accomplish; we err most completely in judgment, however, if the machine which is the subject of this patent, be found to accomplish either of these objects. The intention is to work a sledge hammer of ten or twelve pounds weight, by means of levers and springs, instead of by the direct application of muscle and nerve to the handle of that instrument.

The hammer handle is to have one end fixed in a roller of eight inches in diameter, and working on gudgeons. The hammer is kept up by means of springs at the back of the machinery, which draw a chain wound round the roller, and it is to be brought down to strike by means of a lever, fixed much in the manner of the common turning lathe treadle, which also operates upon the hammer by the aid of a chain wound round the roller in a direction the reverse of the former. How this lever, or treadle, is to be acted upon, whether by the hand or the foot, is not told us; we suppose, however, that it will require a stout fellow, with two hands, to produce an effect by it much less than that which he might accomplish without the assistance of rollers, levers, chains, or springs.

In the southern states, striking is a lazy business, as the striker never swings his sledge, but uses it in the manner of the small hammer, even in the heaviest work which he performs. Perhaps a machine like that proposed, may answer where there is so little economy of human labour, as is usual in the slave states, and where two common field hands may be taken to vibrate a lever, although they might be unable otherwise to strike more than once in a place. It, however, will never find its way into those districts where it is deemed important that power should be used, and not wasted.

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3. For a *Mill for Grinding Grain, Coffee, &c.;* Jacob Stroub, Charleston, South Carolina, September 6.

This mill is exactly like the common cast iron vertical coffee mill, now so generally used. The manner of making the furrows is represented in the drawing; in this, however, we see nothing peculiar, nor is a word said about it until we come to the claim, which is to "the combination and arrangement of the several parts, but particularly the manner of furrowing the runner and permanent plate."

As to combination and arrangement, there is nothing new, and if any thing of this character exists in the furrowing, we are left in ignorance respecting it.

4. For a *Machine for Hulling Clover Seed;* Hildreth Robbins, Wilton, Kennebeck county, Maine, September 6.

A conical tub is to be lined with sheet iron, punched so as to form a grater, or rubber, and within this, there is to be a conical runner, prepared in a similar manner, by covering it with punched sheet iron. "The invention and improvement of this machine, claimed by the subscriber as his invention, principally consists in said tub and *cylinder.*"

A machine with fewer claims to novelty could not well be *invented* at the present day, as many similar to it may be *discovered* in actual use, and others which are not in use, having been long since worn out in the service.

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5. For a *Metallic Hone and Elastic Razor Strap;* Elisha M. Pomeroy, New Haven, Connecticut, September 6.

In the year 1821, Mr. Pomeroy obtained a patent for a razor strap on which he used the oxide of tin as the sharpening paste; in the present instance, he employs the same material, but makes a difference in the construction of his strap. A piece of wood is to be covered with leather, in the usual way, and then coated with the oxide of tin; this he calls his *metallic hone.* A case made of bonnet board is to be fitted on to this *hone,* so that it will touch its edges, but stand at some small distance from it on its sides. This case is also to be covered with leather and coated on each side with the oxide of tin, but of greater fineness than that on the *hone.* The elasticity of this case is spoken of as constituting the main improvement, and he claims "the principle of its combination, whereby the inconvenience of a hone and strap in separate articles is avoided, by a neat and simple combination of both in a single article: and the principle of elasticity thus obtained, which resembling that of the string of a musical instrument, effectually prevents the rounding of the edge of the razor whilst strapping."

The inner strap above described, whatever good purpose it may answer, cannot be made to possess the attributes of a hone, a main purpose of which is to bring the razor to an edge without *any* rounding, and it must not, therefore, possess *any* elasticity. It is necessary, with a hone, to be able to sharpen a razor by carrying the edge foremost, which cannot be done on a leather strap. Should the use of the hone, however, be less frequently required when this strap is employed, than with others, it would still be no small improvement; those who have used it, speak well of it.

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6. For an improvement in the art of *Dressing Deer Skins;* Orin Kyes, Norwich, Chenango county, New York, September 6.

The successive operations to be performed upon the skins are given in the specification of this patent, but without the slightest intimation of the points in which the novelty of the process consists; and, most assuredly, it is not new in all its parts. The operations are given in six sections, by the first of which the skins are directed to

be soaked in rain water for two days, and then beamed on the flesh side; they are then placed for five or six days more, in a liquor formed by putting a peck of lime and three quarts of strong lye, to a barrel of water;—they are then to be taken out and grained, and put into a sour liquor to neutralize the lime and potash. This acid liquor is formed by the fermentation of wheat bran in water, in the proportion of about half a bushel to a barrel;—after laying in this twenty-four hours, the liquor is to be beamed out of them, and the grained side done over with tanners' oil, milled for an hour, suffered to dry for some time, and then put into strong soap suds for twenty-four hours; when taken thence, they are to be thoroughly dried, scoured clean with lye, dried a short time, and beamed;—the last process consists in soaking them thoroughly in the liquor formed by scouring out the oil with lye, drying, and scouring them with soap-suds, drying again, and finishing them with pummice stone.

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7. For a *Wind Mill Pump;* James Kerr, Maury county, Tennessee, September 6.

This apparatus consists of a wind mill, with half a dozen vanes, by which a horizontal crank shaft is driven, to work the pump rod. After describing the mode of putting together, and connecting the various parts, we are told that "the right of the above combination of mechanical principles, is claimed." There, however, is nothing new in the general plan, or in the particular combination of the parts employed. Water is raised in many places by means of wind mills, and those who wish to employ them may find such as are both simple and effective, without the incumbrance of an exclusive right.

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8. For an improvement in the *Escapement of Clocks;* Orsimus R. Fyler, Bradford, Orange county, Vermont, September 6. (See Specification.)

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9. For a *Dovetailing Machine;* Ari Davis, Lancaster, Worcester county, Massachusetts, September 6.

The essential principle of this machine is said to be "the application of circular saws and cutters to dovetailing, or locking boards through their whole length, and this principle is claimed as being new; not only in the machine described, but the general application of circular saws, or cutters, for the purpose of dovetailing or locking boards breadthwise, as before described."

Circular saws, and conical revolving cutters, are made to revolve on horizontal and vertical shafts, so formed and arranged as to suit the kind of work for which they are to be used. The boards are placed upon carriages, which must also be adapted to the purpose to be accomplished, and for which particular directions cannot be given.

When much work of one particular kind and size is to be executed, a dovetailing and locking machine of the character pointed out, might undoubtedly be used to great advantage, but in other cases, where the machine would have to be set for the particular job, this adjust-

ment would demand more time than would be required for the execution of the work in the common way.

10. For a *Machine for Pegging, or Nailing, Boots and Shoes;* Asa Woodruff, Westford, Chittenden county, Vermont, September 6.

This machine is for inserting pegs, or nails, singly; it is to be drawn round the edge of the sole, an awl perforating a hole, and a hammer driving a nail or peg in that last perforated, at each stroke. The claim is to "the application of the spring to the pegging awl, and to the hammer, for the purpose of withdrawing the awl from the leather, and elevating the hammer; and also for the purpose of perforating the hole and driving the peg, or nail, by one blow, at the same time, aided by a self-adjusting feeder, and regulated by a cog wheel and gauges, springs, and dogs, to enable the workman to insert every peg, or nail, in a boot, or shoe, equidistant from the edge of the sole, and of equal depth; to prevent breaking or mutilating the pegs, or nails, and to save the greater part of the labour and time required in executing good work by pegging, or nailing, boots, or shoes."

11. For a *Straw Cutter;* Jonathan Howlet, Greensboro, Guilford county, North Carolina, September 7.

A cylinder eleven inches long, and twenty-two in diameter, is made to revolve on gudgeons, by means of a cog wheel and pinion. Knives extend from end to end of the cylinder, standing off at a proper distance from its periphery, and firmly secured at each end. The straw is to be brought up to the cylinder between feeding rollers, and rests with its ends upon an iron bar, against which the knives cut. The machine is merely described, without any claim being made; therefore, unless it is entirely new in its general construction, which we think is far from being the case, the patentee has secured nothing but the name of a patented machine.

12. For a *Thrashing Machine;* Jeremiah Fisk, Weld, Oxford county, Maine, September 9.

We have had more breathing time than usual between this and the last thrashing machine, but there has not much of novelty resulted from the respite, as the difference between this and its predecessors is very slight. There are the usual cylinder and concave, both of which are to be covered with sheet iron, punched so as to give to its surface the form of a grater. As it is without beaters, it resembles many of the rubbing machines, excepting in its form, and mode of feeding, which do not differ from most of the patented thrashing machines.

There is no claim made, or any thing pointed out as sustaining the character of novelty.

13. For a *Screw Auger;* Peregrine Williamson, city of New York, September 9.

The improvement here patented, consists of a plate, or cutter, of

steel, to be fixed on to the end of the common screw auger; which plate can be renewed at pleasure, when worn out or broken. The plate is to be made somewhat in the form of a half moon, adapted in size to the auger, and so shaped as to cut smoothly. It may have a hole for the ordinary centre screw to pass through, and be fixed in its place by one or two screws, according to its size. Upon one edge a lip is to be raised, like that upon a centre bit, to cut the edge of the circle, and make a clean hole. The claim is to the plate so formed and fixed.

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14. For a *Fanning Mill*, for cleaning grain; Nathan Wells, Milford, Pike county, Pennsylvania, September 11.

This fanning mill is made much like those in general use; but the grain is to be carried from the apron, in a direction the reverse of that usually followed. and thrown within one inch of the points of the fans, or wings. The apron, or shoe, at the bottom of the hopper, is to have an up and down motion communicated to it by means of pins on the cog wheel, or its shaft. The hopper is placed at the back of the cylinder, or wind wheel, instead of at top; the patentee says that the advantages resulting from his arrangement, are, the decreased size of the machine; its requiring but about half the timber usually employed; its more rapid execution of the work, and its being afforded at a diminished price; all which, if correct, certainly constitute a real improvement.

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15. For a *Straw Cutter;* Isaac Lewis, Knoxville, Knox county, Tennessee, September 12.

This machine is described very clearly, and there is probably enough of novelty in it upon which to found a claim; but this has not been done, and we are therefore compelled to resort to conjecture, or to drop the inquiry after what is intended to be patented. Several parts which are as distinctly set forth as any others, have been long in use; such, for example, as a feeding trough to contain the straw, and the forcing it forward by a rake or comb, or by feeding rollers. There is to be a cutting knife placed obliquely across a frame, which is worked up and down between fender posts, like the frame of a saw mill. By turning a crank, the necessary gearing is set in motion, which is regulated by a fly wheel. The feeding, as we have indicated, is effected in a well known manner, and the knife is made to rise and fall by means of a crank and pitman; all which appears to be very well arranged.

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16. For an improvement in the *Wheat Fan;* John Deakyne, Petersburg, Dinwiddie county, Virginia, September 13.

The improvement which forms the subject of this patent is clearly set forth, and distinctly claimed. It consists of a cylindrical wire sieve, open at each end like a bolter, and revolving without either arms or axis. This cylinder may be eighteen inches in diameter, and twenty-five inches long; it has on each end a hoop of suffi-

cient strength to enable it to retain its cylindrical form. Above it there are two shafts with whirls on them, over which straps or bands pass, which descend, and embrace the periphery of the cylindrical revolving sieve, near each of its ends.

The improvement claimed, "consists, first, in a revolving sieve, or riddle, having neither arms nor axis. By this improvement, all the interior of the sieve is free from any obstruction to the passage of the straw, chaff, or grain; and as a much greater surface can be obtained by having the sieve of a cylindrical form, more grain can be cleaned in the same period of time with this improvement, than by those constructed upon the common plan, with flat surfaces. Secondly, in suspending the cylinder, or sieve, in bands, and in the manner of gearing it to revolve as above described."

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17. For an improvement in *Water Wheels*; Ebenezer A. Lester, Boston, Suffolk county, Massachusetts, September 13.

(See specification.)

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18. For an improvement in *Nails and Spikes*, denominated the Grooved and Flanched Spike; Thos. W. Harvey, Jamestown, Chataque county, New York, September 14.

(See specification.)

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19. For *Printing Books, &c. by improved machinery*; Harvey Betts, Norwalk, Fairfield county, Connecticut, September 14.

We are informed by the patentee that the general principle of his invention, is the printing of paper in a continuous sheet, on both sides, either directly from the machine on which the paper is made, or from a reel, or roller, upon which it is wound.

We know that the printing press has been actually appended to the cylinder paper mill, by a gentleman in this country, so as to print the sheet as it is made; and we also know that it has been frequently proposed to do so by others; but we are unable to perceive any advantages from such a procedure which would not be more than counterbalanced by its unavoidable inconveniences. Paper has been printed from a sheet of many hundred yards in length, on one side, but we doubt whether this has been advantageously done, on both sides, although it has been attempted, on a cylinder machine. It would be no easy thing in this process to make good register for book work, although it might answer in the newspaper press. Should the present patentee have accomplished this, he will certainly have made another great step in the typographical art. It appears, however, that he has followed the usual, and almost unavoidable course of inventors, in patenting his machine before it has been essayed with that care which is necessary to the establishment of its character. The inventor says, that with the imperfect press by means of which he has experimented, he has seen a length of paper printed in ten seconds, sufficient to make eleven sheets of medium, with paper of only two

feet in width, whilst he has it in contemplation to extend this width to ten, or even *twenty* feet. We have no reason to doubt the goodness of his judgment as a printer, but we cannot say so much of him as a practical mechanist. A cylinder paper machine, and a roller printing press, twenty feet wide, would, we think, appal the great mechanician of Syracuse, had his life been prolonged in vigour to the present day, and his mind imbued with a knowledge of all the wonders which have been effected in the mechanic arts. We like enthusiasm, however, as without it men will almost invariably fall short of what it is in their power to accomplish.

The description given of this apparatus, and the drawing which accompanies it, are both of them crude, being defective in those details which would enable any person to carry the plan into effect; this, we apprehend, has arisen from causes to which we have already made some allusion. Three different processes, and modifications of the machinery, are spoken of as being contemplated by the patentee; he has not, however, made claim to either of them, and the entire novelty of each, in all its parts, may certainly admit of doubt.

It is said that this machine differs from the Napier press in the employing of the whole surface of the cylinder, instead of allowing its intermitted action during the process of inking.

In the first method proposed, stereotype plates are alone to be employed; these are to be firmly attached to a set of blocks, not fewer than six, of the width of a page, and in length equal to that of the paper, "which may be indefinite." The blocks are to be hinged together on their edges, so as to form an endless chain. They are to be carried over a polygonal roller of wood, strong enough to sustain the pressure of the cylinder, by which the impression is made.

In the second process, either stereotype plates or movable types are to be employed upon similar blocks, united by strips of iron in such a way as never to be inverted, so as to allow of the falling out of the types, In the first process, the inking is to be effected below, in the second above, the types, or blocks.

A third method noticed, is the employment of two or more movable forms, passing over a roller, and under a cylinder; the forms after receiving the impression are to descend under the roller, and thence be returned to the position in which they are to receive a new impression.

The modes of inking may be various, but that preferred is by the employment of an endless apron of leather, as wide as the form, and revolving round two rollers about nine inches apart. This is to receive the ink from one roller, and to communicate to another, whence it is to be transferred to the form.

We have thus given an extended account of this patent; and if it be not a clear one its deficiency in this respect does not rest with us, as we have carefully examined the specification and drawing, which ought, in conjunction, to make the plans fully known. We have not resorted to the model, which is referred to in the specification; the reason for omitting this, has been assigned on more than one previous occasion.

20. For a *Swage Hammer*, called the Upright Spring Swage Hammer; William Field, North Providence, Providence county, Rhode Island, September 14.

What is here called a swage hammer, consists of a vertical slide of iron, confined by a suitable frame, or socket, and having, at its lower end, a perforation to receive a die, or swage. Immediately below this is an anvil, which is also furnished with an opening to receive a face, or swage, and a hole to wedge it out when it requires to be removed. Of these hammers and anvils any convenient number may be placed in a line, and a revolving shaft furnished with cams, or lifters, raises the hammers, or slides, and allows them to fall upon the work. To increase the force of the blow, springs are made to bear upon the upper ends of the hammers, and by means of a lever, or treadle, the pressure of these springs may be increased at pleasure. Each hammer is furnished with a catch by which it may be held up when it is to be put out of action.

The patentee claims a patent for "the invention of said machine, and for applying it to the purpose of blacksmithing; for the construction and form of the hammers; for the plan of putting in the faces and dies; for the plan of holding the hammer up when stopped, by a spring and catch; for the manner of connecting the hammers to the main iron plate, or bars, by straps, friction rolls, and bolts; for the manner of giving the blow by the spring and lever connected by an iron rod, at the pleasure of the workman; for the manner of drawing back the catch and setting the hammer in motion; for the manner of wedging out the faces and dies, and for being able to put from four to six hammers into the space generally occupied by one trip hammer."

Perhaps a claim to the particular arrangement of the foregoing machinery, might have been sustained; but in descending to all the particular parts, some of which are probably as old as the time of Vulcan, we are convinced that there are things claimed which are no more patentable than would be the unlocking of the shop door, and the lighting of the forge fire.

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21. For an improvement in *Water Wheels;* Ezekiel M'Guier, and Joel Dewey, jr., Waterford, Saratoga county, New York, September 14.

In this wheel, the water is to descend through a vertical penstock, or trunk, and to pass into a chest, or box, projecting from one side of its lower end and over this the wheel is placed. The top of this chest, or box, is to be perforated with holes, in an oblique direction, to guide the water against the oblique buckets of a wheel, on the bottom of a vertical shaft, which is to be turned by the impulse it thus receives. The top of the shaft is to be loaded, to prevent its lifting by the action of the water.

The wheel, and its appurtenances are very imperfectly described, and inadequately represented in the drawing. So far as we understand it, however, we do not believe that it will be found to be any

improvement upon the common reaction wheel; but, in fact, inferior to it, doing less work with the same quantity of water.

The claims are to "the trunk, or covered spout, running horizontally from the bottom of the penstock to convey the water under the wheel. A valve, or wicket, at the mouth of the horizontal trunk, or spout, where the water enters the penstock. A platform with diagonal holes through which the water propels the wheel. A shaft with circular, or any other floats, or buckets, attached thereto, to apply on said platform. The manner in which the water is applied through diagonal spouts, or holes, in any manner or shape whatever, spouting upwards."

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22. For a mode of *Propelling Saw Mill Carriages;* Joseph Michenor, Chester, Clinton county, Ohio, September 16.

We cannot make our description more brief than the specification, which consists of only four lines of reference to a drawing. The carriage is to rest on friction rollers. A rope, or chain, passing twice round the rag wheel shaft, and attached to the carriage, serves to move it, instead of a wheel and cogs.

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23. For an *Apparatus for Blowing Glass,* denominated an Artificial Glass Blower; Joseph Stouvenel, and Francis A. Martin, Philadelphia, September 16.

A metal tube is to be made which may be sixteen inches long, and one and a half in its interior diameter. This is to be open at one end, and closed at the other; a spiral spring is to fit within it, the coils of which may be half an inch apart, when extended, in which case it occupies the whole length of the tube. A piece of wood, covered with leather, is to form a piston, which may be inserted in the open end of the tube, and fits it air tight, whilst it will slide freely in it. This piston has a hole through it, to receive the mouth end of a blow pipe, which it must surround accurately. By pressing upon the metal tube, when the blow-pipe is so placed, the air within it will be forced through the pipe, with a power, it is said, four or five times as great as can be exercised by the lungs. Articles in open moulds may be blown by the mouth at one operation, which could be accomplished by the mouth in the old way.

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24. For a *Machine for Dressing Staves;* Lemuel Reed, of Madison County, and Alfred Willoughby, Rochester, Monroe county, New York, September 16.

This machine is less perfectly described than it merits to be; as it may undoubtedly be made to dress a stave on both sides in a very perfect manner. Its general structure, however, may be very well understood from the drawing; and we believe it is so far new that it may be defended, although there is no claim.

A wheel turning on an axis, is furnished with knives on its periphery, which are to dress the inside of the stave; a wheel, or hoop, is concentric with, and surrounds the former, at such a distance from

it as is required for the thickness of a stave, and the knives by which it is to be dressed. This hoop is furnished with knives, or cutters, on its inside, and its outside is supported by three friction rollers, running in grooves made on its periphery for that purpose. A strap around the periphery of this hoop, and round a drum on the shaft of the interior wheel, will cause them to revolve, and the stave is to be passed between them by a proper feeding apparatus. It is said that by water, or horse, power, one such machine will dress from twelve to fifteen hundred staves in a day.

There are no details given respecting the cutters, or the feeding apparatus, which is a manifest defect, as it is the duty of every patentee so to describe the thing patented, that a competent workman may be able to make it without the exercise of inventive genius.

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25. For a *Door Lock*. First patented May 18, 1832. Patent surrendered and reissued on an amended specification; James Kyle, Ramapo, Rockland county, New York, September 16.

We gave a full notice of the construction of this lock, in vol. x. p. 341. The patent has been surrendered for the purpose of giving greater precision to the specification, and distinctness to the claims, than was done in the first instance.

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26. For an improvement on the *Door Lock*, for which the preceding patent was obtained; James Kyle, Ramapo, Rockland county, New York, September 16.

We mentioned the lock upon which this is an improvement, in very favourable terms, and those alterations which experience has suggested in it, have certainly rendered it much more perfect. For the lever latches, working upon a fulcrum, and raised by the key, of which we spoke particularly, there have been substituted plates of metal, which slide up and down, and in so doing are acted upon by the cams on the key, without its being necessary to depend upon their own gravity in resuming their places. We have examined one of the locks, which is placed upon a bank door, and have seen few, if any, which are equally simple and secure. As we formerly observed, a drawing would be required to render its construction intelligible.

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27. For *Cutting Horse Shoe and other Nails*, from Bars or Plates of Iron; Edward Rolph, North Providence, Providence county, Rhode Island, September 16.

Grooved rollers, such as are now in use, are to be employed to make ridges crosswise of a bar, or plate, from which nails are to be cut, which ridges, in the process of cutting, are to form the heads of the nails. These are now to be cut with the ordinary machinery, lengthwise of the bar, or plate, so that the grain of the iron will be in the proper direction for the requisite toughness.

"What I claim as my invention, is, the grooving of the ridges on the bars, or plates, for the heads of nails, by the application of the roller,

and the process of cutting the nails lengthwise of the bar, or with the grain of the material."

A patent for a procedure identical with the foregoing, was granted on the 25th of October, 1832, to Freeman Palmer, of Buffaloe, New York, and is noticed at page 233, vol. x.

[TO BE CONTINUED.]

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for an improvement in the Escapement of Clocks or Time Pieces. Granted to ORSIMUS R. FYLER, *Bradford, Orange county, Vermont, September* 6, 1832.

To all whom it may concern, be it known, that I, Orsimus R. Fyler, of Bradford, in the county of Orange and state of Vermont, have invented an improvement in the mode of constructing the escapements of clocks, or time pieces, and that the following is a full and exact description thereof.

Instead of using springs upon the pallets of verges, in the manner described by me in the specification of a patent for improvements in wooden and other clocks, granted to me on the 13th day of June, 1831, I apply a spring to act upon the pin, or arbor, on which the verge vibrates, in a way to be presently described; varying the same so as to adapt it to the particular construction of the pallets; or sometimes I give to the pin itself sufficient length to allow of its operating by its own elasticity, in such a manner as to effect the object which I have in view; my improvement consisting in the practical adoption of a principle, which may be variously modified.

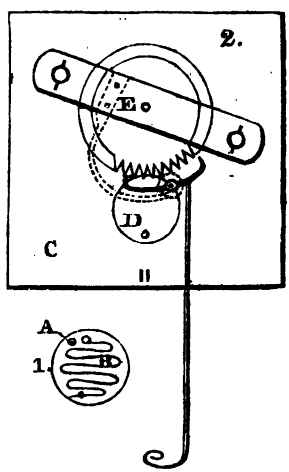
My usual method of attaching a spring to, or causing it to act upon, the pin, is as follows. I take two disks, usually of brass, which may be about an inch in diameter, and a line, more or less, in thickness; through each of these plates, or disks, I make a small hole, near to the periphery thereof, as shown at A, in the accompanying drawing. To one of the disks or plates, I attach a spring, which may consist of wire, coiled, or bent, in a serpentine direction, or made in any other manner. In the drawing, the spring B, is represented as serpentine, attached to the plate by one end; a loop, or eye, in the other embracing the pin upon which the verge socket turns. For a pendulum vibrating half seconds, and with a bob weighing about eight ounces, I have found wire No. 30, to be of a suitable size.

To receive this spring, I make a hole through the front clock plate, nearly as large as the before named disks, one of which is to be attached on each side of the plate, so as to stand parallel to each other, with the holes for the pin coinciding, and a space between them forming a chamber for the spring. I then pass an elastic metallic pin, through the holes in the disks, which must be sufficiently large to allow it to have some play within them. One end of the pin has a swivel head, the other end being fitted to receive the verge socket. Sometimes I enlarge the hole in the outside disk, and support the

outward end of the pin by means of a bridge placed outside of the socket of the verge; care being taken to make the aperture in which the pin rests, something larger than the pin itself. The verge and socket I construct in the way usual in recoil escapements, taking care that all the parts be made as light as can be eligibly done. The verge I usually allow to embrace about one-fifth of the circumference of the balance wheel, escaping in the common manner, taking care to place the pin which supports the verge, as near to the crown or balance wheel, as can be conveniently done, so that the recoil may be increased upon the horizontal pallets, and proportionably diminished upon the vertical section of the verge; the horizontal pallets being most relieved by the action of the spring, as is known to those scientifically acquainted with the subject.

In fig. 2 of the drawing, the verge is represented as placed upon the pin, under the crown or balance wheel.

The advantages of this mode of construction are, that the elasticity of the action of the pin, relieves the recoil, thereby producing a more free and easy motion, and admitting of finer teeth in the crown wheel; all the functions of the escapement will consequently be performed with less motive force, and with less oiling, than is required for common escapements.



What I claim as my invention, and for which I ask a patent, is the principle of giving relief in recoil escapements, by means of an elastic pin, and likewise by coiled, spiral, or other springs, attached in such a manner as to support the pin, and to press it lightly towards the crown wheel.

Fig. 1, represents one of the disks, having a hole in it at A, for the verge pin to pass through, and the bent spring B, fastened at the lower end to a pin, and with a loop at its other end to embrace the verge pin.

In fig. 2, C, is the clock plate, D, one of the disks let into it, and having the spring B on its under side. E, a bridge to remove the pivot of the crown wheel. The dotted line represents a piece of brass, which sustains the pin of the verge at its outer end.

ORSIMUS R. FYLER.

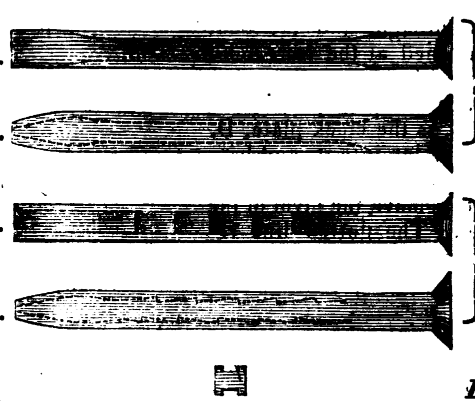
Specification of a patent for an improvement in Nails and Spikes, denominated the Grooved and Flanched Spike. Granted to THOMAS W. HARVEY, *Jamestown, Chataque county, New York, September* 13, 1832.

To all whom it may concern, be it known, that I, Thomas W.

Harvey, of Jamestown, in the county of Chataque, and state of New York, have invented a new manufacture of nails, or spikes, which I denominate *the grooved and flanched spike*, to be used in the fixing of rails and chairs in the construction of rail-roads, and for other purposes, where it is desirable to attach articles by nailing, more firmly than it can be done by nails, or spikes, of the ordinary construction: and I do hereby declare that the following is a full and exact description of the construction of, or form given to, such nails or spikes.

When these spikes are to be used for plate rails on rail-roads, or other similar purposes, the head and neck of the spike, for the thickness of the rail, is made in the usual form, but the remainder of the shank, or stem, of the spike, from the neck to the point, or until the point is approached, is grooved on two sides, in such a way as to leave four projecting flanches, or fillets, thereon, one along each edge. The section of the spike in the grooved part of the stem, will then appear somewhat in the form shown in fig. 3, in the accompanying drawing. Figs. 1 and 2, represent two varieties in the shape given to the lower part of the groove, which, however, may be indefinitely modified, without changing the principle. No. 1, in each figure, shows the grooved, and No. 2, the plain side of the spike, the dotted lines in the latter representing the manner in which the bottom of the groove may be swelled, or serrated, for the purpose of causing it to hold the more firmly in the wood.

I do not think it necessary to describe any machinery by which such nails, or spikes, may be made; that which I use is of my own invention, and for which I obtained a patent on the 24th day of January, 1832, but they may be made by any adequate implements or machinery.



No. 1. No. 2. Fig. 1.

No. 1. No. 2. Fig. 2.

Fig. 3.

What I claim as my invention is, the giving a new form to nails, or spikes, by grooving them on their sides, so as to form flanches, or fillets, on their angles; whether this groove be made of equal depth

throughout its whole length, or whether the bottom thereof be undulating, swelled, or serrated, in the manner herein described, or made of iron, copper, or other metal, or varied in any way which does not essentially change the principle, or manner of construction.

THOMAS W. HARVEY.

Specification of a patent for an improved Water Wheel. Granted to EBENEZER A. LESTER, *Boston, Massachusetts, September* 13, 1833.

To all persons whom it may concern, be it known, that I, Ebenezer Avery Lester, of Boston, in the county of Suffolk, in the commonwealth of Massachusetts, in the United States of America, have invented an improvement in water wheels, for the use and application of water, whether acting by projection or gravity, for propelling and operating mills, or any machinery.

In operating said wheel, the water which is to be used as a propelling, or moving power, is to flow or pass from the pond, flume, or reservoir, whencesoever it may be taken, through the hollow shaft of the wheel, which revolves with the wheel, or through a hollow trunk, canal, or inlet of any form, either inclosing the shaft, (which in such cases may be solid,) or connected with the end of the shaft, or with the wheel, engine, or apparatus itself, by means of suitable collars, or hollow joints, or other junctures.

From the shaft, or any suitable part of the wheel, motion may be communicated to the mill, machinery, or body, or weight to be operated or moved, by means of the usual and ordinary gearing, or otherwise.

The said wheel consists of one or more pipes, ducts, or conduits, through which the water is to flow, or pass, and its force, or gravity, to be applied, which pipes, ducts, or conduits, whether one or more, in case the successive parts in their length are at different distances from the axis of motion, pass, by a spiral sweep, from the part of the propelling or acting portion of the wheel nearest to its axis of motion, (but at a greater or less distance from that axis, as the constructor may choose,) to the periphery of the circle of motion of the wheel, in such manner that, if a plane be described through the axis of motion of the said wheel, and through the radius of that axis, passing through the extremities of the pipe, duct, or conduit, nearest to that axis, and such plane be produced, or extended to such periphery, the other, or exterior extremity of the pipe, duct, or conduit, will either be intersected by such plane, or at least will be but a comparatively small proportion of such circle of motion from it. The most perfect construction is deemed by the inventor to be that by which the pipe, duct, or conduit, makes a spiral sweep of an entire circle, so that its two extremities will be intersected by such a plane; but mathematical precision in this respect is not usually attainable in mechanical constructions, and any departure, whether by intention or otherwise, from this plan of construction, to the extent of some comparatively small portion of the circle of motion, is deemed by the

inventor to be within the principle and just extent of his invention, as long as the construction should be substantially equivalent to this plan.

But the said wheel may be so constructed that the successive parts, in length of each pipe, duct, or conduit, through its whole extent, shall be at the same distance, or just about the same distance, from the axis of motion, as if bent, or by being in fact bent spirally round, or within, a cylinder, so that the water, shall be admitted into the pipe, duct, or conduit, either at the upper or higher end of the cylinder, if it stands perpendicularly, or obliquely, or at the most convenient end, if it be placed horizontally. In this case, also, the condition, as to the relative situation or position of the extremities of the pipe, duct, or conduit, will be as above described.

The said wheel, or the base of the figure described by it in its motion, may be horizontal in position, or at any angle to the horizon, or the pipes, ducts, or conduits, where the successive parts, in lengths of each one are at different distances from the axis of motion, may pass off from that axis, so as to make a right, or an oblique, angle with it, and whether they pass off at one or the other, the relative situation of the two extremities of each pipe, in respect to a plane drawn through that axis and a radius to it, will be as above described. If the pipes, ducts, or conduits, pass off at an oblique angle to the axis of motion, each pipe, duct, or conduit, may, in each revolution of the wheel, engine, or apparatus, describe a cone, or hemisphere, or rather a frustum of a cone, or some figure which, as to the curvature of its sides, may be intermediate between them, or between either of them and a cylinder.

The orifice for the admission of water into the pipes, ducts, or conduits, should be so constructed as to admit it very freely.

Thepipes, ducts, or conduits, may be so constructed that a transverse section of one may be square or triangular, circular or elliptical, or of sides of a different curvature, or rectangular, and presenting sides of equal or unequal lengths. It is not necessary, that the pipe, duct, or conduit, should be precisely of the same dimensions throughout its whole length, but it should not, on the other hand, be so irregular that the passage, or current, of the fluid through the pipe, duct, or conduit, shall be disturbed, or irregularly accellerated and checked, and the side especially on which the fluid acts in propelling the wheel, should present to the fluid a very regular, smooth surface, and the pipe, duct, or conduit, should not in any part of its length, be of smaller dimensions than at its orifice of discharge. And the inventor thinks the best construction to be that in which the orifice of discharge is in some degree compressed, and smaller than any other part of the pipe.

The pipe, duct, or conduit, should be so constructed that from one extremity to the other in every successive part in the length, the rate or degree of curvature of the side upon, or against, which the fluid is directed by its motion, that is, the side of the pipe upon which the fluid acts in propelling the wheel, should continually increase or diminish, being greatest at one extremity and least at the other, as if

each successive indefinitely small part of the curve from one extremity to the other, were a part of a circle of greater or smaller diameter than the indefinitely small immediately preceding part of such curve. If the whole length of the pipe, duct, or conduit, be in the same plane, each successive part in its length, from one extremity to the other, will be at a greater distance from, or nearer to, the axis of motion of the wheel, than the immediately preceding part. If the pipe, duct, or conduit, be bent, or curved, as if bent on, or immediately within, the surface, or shell, of a cylinder, cone, or hemisphere, each successive part in the length of the pipe, duct, or conduit, from one extremity to the other, will pass over either a greater or smaller distance (as the case may be) or extent of the axis of the cylinder, or cone, of a radius of the hemisphere drawn perpendicularly to the great circle of the section of its globe, than any equal preceding part in its length.

The pipe, duct, or conduit of a wheel, may be projected on a plain surface by drawing a number of concentric circles, (the more numerous they are, the more accurate will be the projection,) the smallest representing the motion of one end of the pipe in a revolution of the wheel, and the largest, the other end. The space between the smallest and largest circles, will represent the plane, engine, wheel, or apparatus, when constructed. The concentric circles may be at equal distances from each other, or each successive circle in the series may be at a regularly increased or diminished distance from the next preceding, according to the purpose to which the wheel is to be applied, as herein afterwards explained. Radii are then to be drawn from the centre of motion of the proposed wheel, less by one than the number of circles, to the exterior circle, at equal distances from each other. Begin at the intersection of a radius with either the largest or smallest circle, and describe a curve line, passing through the intersection of the next circle, and next radius, and so on through the intersections of each successive radius and circle to the last. This curve will represent a pipe of a plane-wheel, beginning with the intersections of a radius with the smallest circle, and ending with the intersection of the same radius with the largest circle, or vice versa.

It will be evident on inspection, that the curvature towards either end will be increased or diminished, by diminishing or increasing the distances of the successive concentric circle towards that end. This mode of projecting will accordingly afford the projector the means of varying the curvature in the different parts of the pipe at pleasure, as far as it can be varied in a curve beginning and terminating as above described. This is one mode of describing the curve with sufficient accuracy for practical purposes. It may also be described by a movable point regularly sliding on a revolving radius or straight line, and marking the curve, as the radius revolves about a point at which one end is stationary.

The inventor deems the best curvature for the pipe to be such, that if (in case a pipe be such that on being revolved a body may pass in a straight line through it) a particle of fluid, moving with the power proposed to be used, whether that of mere gravity, or that of projec-

tion, and not affected by any other power, should enter at the end of the pipe, and the wheel were turned by a constant motion, so as to make a revolution in the time which the particle would occupy in passing over, or across, the wheel from the circle described by one extremity of the pipe in a revolution of the wheel, to that described by the other extremity, in the direction of a radius to the axis of motion, the particle of fluid would pass through the pipe without touching either side. Such is the general principle in the projection of the pipe, but it is not necessary to the operation of the wheel, to arrive at this result precisely, in its construction. As the momentum and velocity of fluids, whether moving by gravity merely, or by projection merely, or by both combined, are matters of science, concerning which every one may have the means of informing himself, it is unnecessary to mention them in this specification. The preceding directions, with a knowledge of the laws of the motion of fluids, will enable any skilful mechanic to project a plane, wheel, engine, or apparatus.

If the proposed wheel is one in which each pipe in its revolution describes a cone, or frustum of a cone, or hemisphere, or part of a hemisphere, or hemispheriod, or any figure which shall be intermediate between any two of these in degree of curvature of its superfices, or between either of them and a cylinder; it may be first projected on a plane, the smallest circle representing the apex or smallest end of the cone, or the corresponding part of the hemisphere, or hemispheroid, or other such intermediate figure, or portion of either, and the largest circle in the plane of projection representing the base of the cone, or the plane circle of the superfices of the hemisphere, or other intermediate figure, if it have but one plane in its superfices, or if it have more than one, then the largest of them. Let the cone, or other proposed figure, be placed with its base, or its largest plane circle in its superfices, parallel to the horizon. If the plane projection be then placed horizontally over the cone, so that its centre is at the axis of the cone, or if it be placed similarly over the hemisphere, or other proposed figure, then the largest circle of the plane projection will precisely coincide with, and be directly over, the base of the cone, or the lower circle on which such other supposed figure rests. If then a plumb and line be carried round the curve of the plane projection, and, as it is carried round, the plumb be dropped so as to just touch the side of the cone, or other assumed figure, it will describe on its side the curve of the pipe proposed, and any number of pipes for the same wheel may be described in the same manner.

Where the wheel is to be so constructed that each pipe in its revolution shall describe a cylinder, and the whole wheel, if there be a great number of pipes, shall represent a cylinder with the pipes passing spirally round its sides, from one end to the other, the curve of the pipe may be projected on the side of the assumed cylinder by drawing circles round it parallel to its ends, at varying distances, each end being one circle, and drawing straight lines down its sides perpendicular to its ends, less by one in number than the circles, and then describing a curve through the intersections of the successive straight lines and circles, beginning at one end, and passing quite

round the cylinder, and terminating the curve at the other end. The curvature in the different parts will depend upon the proportional distances of the circles, and the degree of curvature to be given to the successive parts is to be determined upon the principles already given.

In projecting the wheel, the assumed figure has been supposed to be in a particular position, but the wheel is not limited to such position in its actual operation.

The foregoing description and directions will be a sufficient guide in projecting the said water wheel, whether the pipe, duct, or conduit, is intended to make a sweep of an entire circle, or only a part of a circle; as a quarter, half, three-quarters, more or less. And though the inventor considers a sweep of an entire circle to be preferable, he does not limit himself to that construction. The mode and principles of projection will be as above described, whether the sweep of the pipe be more or less than an entire circle.

The water may be admitted into all the pipes, ducts, or conduits, (if more than one,) at one and the same time continually, or it may be admitted at intervals into them alternately, or successively, by means of gates, cocks, or valves, or by so placing the wheel, that each orifice of admission may in each revolution be a part of the time above the surface of the water; or the wheel may be so constructed, that the fluid may be shut out from each pipe, duct, or conduit, during a part of each revolution.

The wheel herein described may be made of wood, or of metal, or of both, or of such other materials, and of such diameter and depth, or thickness, and with such number of pipes, ducts, or conduits, as the constructor may choose, having regard to the force to be applied, and other circumstances.

The water may flow, or pass, to the wheel, engine, or apparatus, either horizontally, or from below, or from above, or it may flow, or pass, to the same wheel, engine, or apparatus, both from below or from above, or from both sides, and the same shaft may have one or more wheels attached to it.

The said wheel may be placed in a flume, reservoir, or in the body of water used to propel it, in such manner that the fluid having passed through the pipes, ducts, or conduits, to propel the wheel, may be discharged by means of a hollow shaft, or otherwise.

In case the wheel, is constructed by bending, as if by bending the pipe, duct, or conduit, or each of them, round, or within, a cylinder, spirally, the water will be admitted only at the periphery of the circle described by the motion of the wheel, engine, or cylinder, as the pipes will, in such case, be situated wholly at the periphery.

This invention consists in, and a patent is claimed for, projecting and constructing the pipes, ducts, or conduits, with the curvature, on the plan, and in some of the modes and forms above described for a water wheel.

EBENEZER A. LESTER.

ENGLISH PATENTS.

Specification of the patent granted to WILLIAM RANGER, *Builder, for a Cement or Composition, which he denominates "Ranger's Artificial Stone." Dated June* 4, 1833.

To all to whom these presents shall come, &c. &c. Now know ye, that in compliance with the said proviso, I, the said William Ranger, do hereby declare, that the nature of my said invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the drawing hereunto annexed, and the following description thereof, (that is to say):—

My said cement or composition is intended, as above mentioned, to form blocks, or masses, of artificial stone, to be used in the construction of buildings, in place of brick or stone, or in union with either, or both of them, as occasion may require; and I compose it of silicious or other fit and proper, hard and unchangeable matters, of powdered lime in its pure or caustic state; and of water boiled or heated; and which said water I employ as hot as conveniently may be, in mixing the different ingredients. I likewise occasionally dissolve a portion, more or less, of sulphate of iron in this water, as well also as caseous and other matters, when thought desirable. I prefer to use such stonelime as contains a portion of iron; such, for instance, as that procured in the neighbourhood of Dorking or Reigate, in the county of Surrey; also, graystone lime, lime from blue or yellow lias, or any other lime which is fit and proper for the purpose; and I employ it in the state of a dry powder, not slacked, as usual. The silicious, or other hard materials or matters may be such as are commonly employed; for instance, river or sea sand; screened shingle from the sea shore or beach; the two latter, however, well washed in fresh water to free them from sea salt; or I can employ broken flints, free-stone, copper-slag, or other fit and proper materials of similar natures. Any, or either of these substances, as well as the lime, I separate or reduce into finer or coarser parts, either by hand, or by the employment of machinery similar to that used in making Roman cement, or any other which is fit and proper for the purpose, agreeably to the nature of the artificial stone I design to employ them to form. In general, I prefer to use them in the following proportions, videlicet—silicious or other hard materials or matters, thirty pounds; powdered lime, three pounds; and boiling, or hot water, either containing or not the above matters in solution, one pound twelve ounces. I can, however, vary these proportions occasionally, although I have hitherto found them the best in practice. I avoid mixing more of these materials at once than will be sufficient to fill the mould, as, owing to the heat produced by the boiling or heated water, the setting or concreting action begins immediately that they are put into the mould: and, in general, the mass of artificial stone becomes sufficiently firm in the course of about ten minutes, to admit of the sides and ends of the mould being removed, and the block left upon the bottom of it, ready to be taken to the place where it is to remain to dry and harden, and which will usually happen in the course of a

fortnight, when the block or mass will be fit for use. I cause the materials to be carefully rammed close in all their parts whilst filling the mould with them, in order to expel the air; and remove any excess thereof, by passing a straight iron bar or scraper along the top of the mould; I can then, likewise, when thought desirable, fill any interstices or cavities left in the face of the block, with materials of a finer consistency. The moulds will, of course, vary in their forms and in the manner of framing them, according to the shapes intended to be given to the masses or blocks, of artificial stone; as, for instance, whether they are to be plain or moulded in flutings, or otherwise ornamented or decorated; or whether to be square, circular, or of any other shape; so that it is quite impossible to afford examples thereof to any extent. As, however, it may be desirable to give some idea of their construction, I shall proceed to do so by describing the several figures contained in the drawing, which, as aforesaid, is annexed to this specification, and which represents the various parts of a wooden mould, intended to form plane oblong blocks of artificial stone, each part being designated by a similar letter of reference in all the figures.

Fig. 1.

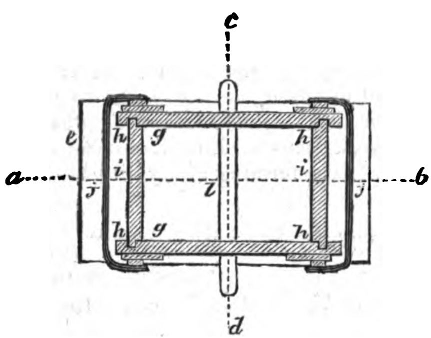


Fig. 2.

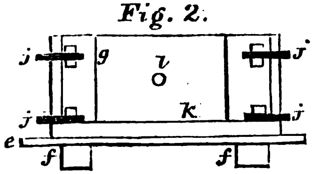


Fig. 3.

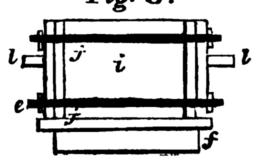


Fig. 4.

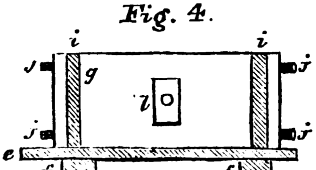
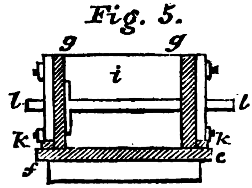


Fig. 5.



e, is the bottom of the mould, resting upon and strengthened by the two cross pieces *f f*. *g g*, are the sides of the mould, each having two upright grooves formed in it, as shown at *h h h h*, in the plan fig. 1, to receive and retain the ends, *i i*, of the mould in their proper situations. These sides and ends are held together by means of four iron bars, *j j j j*, whose ends are bent at a right angle, so as to form clamps, as shown in fig. 1, between the inner ends of which said clamps and the sides of the mould,. wooden wedges may be tightly driven, to hold the mould together in use, and be as easily removed again when it is to be taken asunder. There are also two wooden ledges, *k k*, affixed upon the bottom of the mould, as shown in the end section, fig. 5, to retain the sides and ends of it steadily in their places upon it when in use.

Fig. 2 is a side elevation; and fig. 3 an end elevation of the mould; and fig. 4 is a side elevation and section of it, taken at the dotted line *a b* in fig. 1.

Fig. 5 being an end elevation and section taken at the dotted line *c d* in fig. 1. *l*, in all the figures, is a bar passed through holes made in the sides of the mould, to form a hole through the block of artificial stone. I prefer to place the blocks, or masses, of my artificial stone in the open air to harden, and even to wet them occasionally during that operation.

I do not mean, or intend hereby, to claim as my invention, the use of hot water in mixing mortar for building with; but I do hereby claim the employment of boiling or hot water in combination with dry, powdered, caustic lime, and silicious or other hard matters, in the manner and in the proportions herein before described, as my invention, and as essential to the forming of my said blocks, or masses, of artificial stone. [*Rep. Pat. Inv.*

Patent granted to ALEXANDER CLARK, *for certain improvements in Blowing Machines. Dated January* 15, 1833.

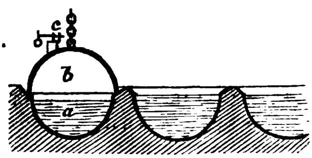
This invention consists of an arrangement of apparatus having a revolving fan, such as is used in many blowing machines now in use; and the chief object at present in view appears to be, the production of a portable machine, to be used as a substitute for the common bellows. To the end of a nosle similar to those used for bellows, is affixed a shallow cylindrical box, which contains a circular disk, mounted on an axis which turns in bearings at each end, in the covers of the cylindrical box. On to the disk, and at the outer edge thereof, vanes are affixed at right angles, and at one end of the cylindrical box, an opening is cut for the admission of air; and on to the axis which carries the revolving fan is a small wheel, which is kept, (by means of a spring,) in contact with a large wheel which has its axis affixed on the nosle piece.

The manner of using this machine is as follows:—It is held in the left hand, and by means of a handle affixed on the large wheel, this wheel is caused to revolve, and by the friction of its periphery, the small wheel is made to revolve rapidly, and drive the air through the

nosle. In order to prevent noise or rattling of the parts, the patentee recommends that the large or driving wheel should be covered with buff leather. [*Ibid.*

¶ *To* ABRAHAM GARNETT, *Esq. for his having invented certain improvements in Manufacturing Sugar. Sealed July* 7, 1830.

The particulars of this improved mode of preparing sugar are not very clearly described in the specification. It appears that the object of the patentee is to promote the crystallization or concentration of the sugar by the employment of an apparatus, in which a partial vacuum is produced above the sirop in the pan, or *teach*, as it is called.



The annexed figure is a sectional representation of a series of pans or boilers, in which the cane juice is placed for the purpose of boiling and evaporating; *a*, is the last pan of the series called the teach, into which the sirop is to be poured by a ladle from the pan preceding it. The upper edge of the teach has an inclined flanch, upon which the edge of the hemispherical cover *b* shuts down with an air tight joint. This cover may be raised and lowered by a chain and pulley, by means of a lever, or otherwise; and a safety valve *c*, is placed in the upper part of the hemisphere to allow of the escape of steam when the sirop is boiling.

According to the statement of the patentee, the heat of the boiling sirop will cause the atmospheric air to be expelled from the dome or hemispherical cover, and by that means produce a partial vacuum within. Under this partial vacuum, the evaporation from the sirop will go on with a rapidity very much greater than if the surface was exposed to the atmosphere, and the steam evolved will escape through the valve *c*, at top, thereby leaving the dome vessel in a constant state of exhaustion.

As the evaporation goes on from time to time, fresh supplies of the sirop are to be introduced from the adjoining pan, in which case the dome is to be raised a few inches only while the sirop is poured in, and then the pan is to be closed again air tight, the steam thrown off by the boiling of the sirop escaping at the safety valve.

When the sirop has acquired a sufficient degree of concentration, it may be discharged into the ordinary cooler, and, after remaining there for twelve hours, may be placed in boxes having wire gauze bottoms, to allow of the molasses draining through; and, after six days, may be packed as Muscovado sugar, and sent to market.

There is an observation at the close of the specification, that if the sugar is to be clarified by Innes' patent process, it may be drawn out of the *teach* from time to time; and upon every thickness of about three inches of sirop, a slight shower of lime water is to be let fall for the purpose of cooling it. What patent process is referred to we

know not, as no patent has been granted in that name for refining sugar within the last thirty years. [*Lond. Jour.*

¶ *Specification of the patent granted to* WILLIAM AINSWORTH JUMP, *for certain improvements in drawing or extracting Salt from Salt Pans. Dated October* 14, 1831.

In making or manufacturing salt, it is the practice of the salt waller, or boiler, to draw the salt from the pan by raking it to the sides, and then removing the salt by means of a skimmer or perforated shovel. This operation of raking the salt to the sides of the pan is not continually performed, but only from time to time when the salt is to be removed from the pan; consequently, the salt, as it crystallizes, falls to the bottom of the pan, and tends to prevent the heat from the furnaces or fires coming directly to act on the brine, such heat having first to pass through the layer of salt on the bottom of the pan; by which, not only is much of the heat lost, but, at the same time, the action of the heat on the metal, causes there to form what is called "pan-scratch," or "pan-scale," on the upper surface of the pan, and then the contiñuation of the action of the heat quickly destroys the metal. Now my invention is the continually raking of the salt towards the sides of the pan, and into pockets or recesses formed to receive it; thereby, in some degree, preventing the formation of pan-scratch, or pan-scale. But the principal object of such invention, is, the being able to extract the salt from a pan covered, so as to preserve the steam produced from the brine, for the purpose of heating other salt pans. And I perform this operation by means of an arrangement of apparatus or machinery hereafter described; and which arrangement of apparatus constitutes my invention, and consists of revolving rakes set at an angle, whereby the salt is continually raked towards the sides of the pan, till it falls into recesses formed to receive it.

Description of the Drawing.

Fig. 1.

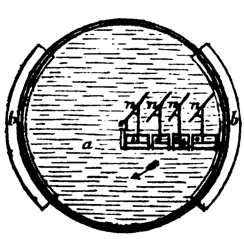


Fig. 2.

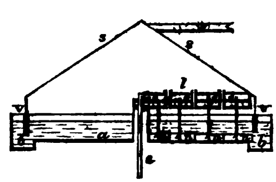


Fig. 3.

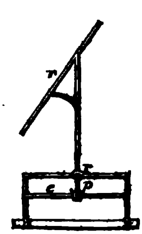


Fig. 1 represents the plan of a circular salt pan, having two recesses formed to receive the salt; or there may be formed a recess all round for the same purpose: from these recesses the salt is to be removed by hand, as heretofore. Fig. 2 is a section of fig. 1, taken through the centre. Fig. 3, is an enlarged view of a scraper and

its frame; and in each of these figures the same letters of reference indicate similar parts; *a a*, being the pan and *b b*, the pockets or recesses to receive the salt as it is raked from the centre of the pan to the sides thereof. The pan *a a*, is set in brickwork, having a furnace or furnaces, as is usual. I will here observe, that I do not confine myself to the use of a naked fire for the purpose of heating the brine in the pan *a a*, but intend to avail myself of other well known means of heating the same, such, for instance, as steam. But as my invention only relates to the means of raking the salt towards the sides of the pan, for the purpose of drawing or extracting the same therefrom, I do not conceive it necessary to be more particular in describing the means of heating the brine, they being well understood. *e*, is an upright shaft, to which motion is imparted by any of the well known mechanical means. On the upper part of the shaft *e*, there is an arm placed, *l*. This arm *l*, carries the scrapers *n n n n*, the handles of which scrapers are affixed in the swinging frames *o o o o*, in the following manner: On the handles of the rakes *n n n n* there are formed hooks *p p p p*, which hook into holes formed into the swinging frames *o o o o*, as shown in the drawing fig. 3. In order, however, to keep the rakes to the intended position, the handles pass through eyes *r r r r*, also formed in the swinging frames *o o o*. By this means, the rakes, by their own weight, keep to the bottom of the pan, and have the property of accommodating themselves, in a certain degree, to the warping, or deviation from level, which generally takes place in the bottoms of salt pans after being some time in use; and as they are caused to revolve by the slow turning of the shaft *e*, they continue to rake the salt from the centre of the pan towards the sides thereof: that rake which is farthest from the centre, drives off the salt which lies in its track, towards the sides of the pan, and forces it into the recesses; the second scraper succeeding the first, rakes the salt towards the sides of the pan into the track of the first, and the third scraper succeeding the second rakes the salt into the track of the second, and so on; and thus is the bottom of the pan continually cleared from salt, and the heat comes immediately to act on the brine. I have described, and have shown, only four rakes; but I would have it understood, that more, or less, may be used, without departing from my invention. The shaft *e*, is protected from the action of the fire by a wall of brickwork. *s*, shows the cover of the pan inserted in the water-lute-joint v, and to be suspended by a counterpoise, so as to be easily raised and lowered for the purpose of scumming or clarifying the brine, changing the scrapers when clogged with salt, or any other necessary purpose. w, the pipe conveying the steam under another salt-pan.

Having now described the nature of my invention, and the manner in which the same is to be performed, I would have it understood, that I claim as my invention, an arrangement of revolving rakes in salt pans, such rakes being set at an angle to a line drawn through the centre of the pan, whereby their revolving will continue to rake the salt outwards from the centre to the sides of the pan, in the manner above described. *Rep, Pat. Inv.*

¶ *To* Josiah John Gust, *Esq., for an improvement in the process used for producing from iron ore and other materials containing iron, what is called in the iron trade "finers." Sealed January* 31, 1833.

The claim of this patent is for an improved manufacture of what is termed 'finer's metal,' immediately from the blast furnace, instead of casting it into pigs, and allowing it to cool as usual, in the manufacture of iron from ore, or other substances containing iron. The patentee states, that he places his refinery as near to the blast furnace as possible; and the top of the refinery must be under the level of the tap hole of the blast furnace, from whence an iron shute or channel protrudes; and on the furnace being tapped, the fluid iron will flow immediately into the refinery, to be converted into finer's metal, instead of being cast into pigs, and allowed to cool as heretofore.

[*Lond. Jour.*

¶ *On Boring Cylinders.*

The following brief accounts of the progress made in boring cylinders,—so important a feature in that branch of mechanical operation which relates to steam enginery,—we have extracted from that most admirably written, and comprehensive work, "Historical and Descriptive Anecdotes of Steam Engines, and of their Inventors and Improvers, by Robert Stuart:" a work from which the dilettante in mechanical invention will draw a large fund of sound information; while the "Operative" himself will have at his command a compendious body of reference to every valuable improvement that has been achieved in his branch of science, viz. the application of a power, which, next to that of the printing press, stands forth as the loftiest promontory in the chart of human invention.

"The increasing demand for the ponderous machinery of steam engines, having led capitalists to the erection of numerous founderies in different parts of the kingdom, their emulation was greatly instrumental in improving the art of casting and finishing cast iron ware. Carron, the first establishment in regard to magnitude, continued also to be the most celebrated for the general excellence of its productions; and it more especially enjoyed a great reputation for the truth with which its cylinders and pump barrels were bored and polished. The method usually followed was that employed from time immemorial for boring the wooden pipes or pump trees used to convey water. The pipe, placed in a carriage, was made to move forward as accurately as could be, in the direction of its axis, and to press against the face of the borer; this was a tool constructed of several cutters firmly fixed in a solid wheel, which was made to revolve by the power of horses or a waterfall; and as the cutter excavated the centre of the pipe, the frame moved forward so as to keep the tree pressed against the tool.

"But notwithstanding the proportions and modifications which

Smeaton introduced into the boring engine he designed for Carron, and which gave the superiority to the cylinders and pump barrels fabricated in this foundry, over those sent from rival establishments, still the form of the cylinder, when drawn from the mould, influenced more or less that which it could receive from the action of the borer.

"Much of the advantage which now began to be experienced by engineers, from a greater attention paid to the mode of finishing pipes and cylinders, would have, in truth, been greatly circumscribed in their importance, but for an invention of Mr. John Wilkinson, the proprietor of iron works at Bersham, near Chester. In this beautiful contrivance, provided there was a sufficient thickness of metal, the want of truth in the casting of a hollow vessel was quite immaterial; for Wilkinson made his borer advance into the cylinder *along an inflexible rod*, which was fashioned with the greatest possible truth. So that the tool must excavate in a line as true as that which was formed by the rod which guided it; and this, without question, was one of the most important improvements which had been introduced into the machinery for the manufacture of machines. Indeed, so universal was its application, that it may be considered as forming an era in their manufacture, as having laid the foundation of all the wonders which have since been achieved, in giving the utmost accuracy and beauty to implements and machines of every kind, and of every variety of construction.

"But in nothing was its importance more clearly seen, than in the fabrication of the parts of steam engines. Cylinders of five and six feet in diameter, and piston rods of corresponding sizes, could be formed by its agency with the greatest truth, and as much precision as, before its introduction, it was possible to give to the small cylinders of air pumps.

"Watt speedily availed himself of his friend's improvement; and by having his rods and pumps properly bored and polished, he may be said now, for the first time, to have had it in his power to give comparative perfection to his own invention. For even the excellent workmanship of the Carron cylinders was so much surpassed by those made at Bersham, that when a new engine, on the condensing principle, was to be erected at Carron itself, Bolton writes to the chief of the establishment, that he must either change his mode of boring cylinders, or get one bored by Wilkinson, 'for he has,' says he, 'lately bored us some nearly without error; one which we have put up at Tipton, fifty inches in diameter, does not err the thickness of an old shilling in any part;' and in a letter from Watt to Smeaton, he says, 'so great has been the improvement made by Wilkinson, that he can promise upon a cylinder having a diameter of seventy-two inches, not being further distant from absolute truth in the worst part than a *thin* sixpence.' But even this deviation (about the fortieth of an inch) was greater than could be found in these ponderous vessels; for, from the admirable nature of the process, it was next to impossible that so great an error could be produced in a vessel, of however large dimensions."—*Stuart on Steam Engines.*

[*Rep. Pat. Inv.*

¶*Report of the result of an Experimental Journey upon the Mail Coach Line of the Holyhead Road, in Lieutenant Colonel Sir* CHARLES DANCE's *Steam Carriage, on the first of November* 1833.

Public attention having been attracted to the practicability of travelling with locomotive engines upon ordinary turnpike roads, by a report of a committee of the House of Commons, of the 12th of October 1831, stating that, in the opinion of the committee, the practicability of such mode of travelling has been fully established; and more recently by a report of a journey to and from Brighton having been successfully performed by Lieutenant-colonel Sir Charles Dance's steam carriage, as well as by the fact that the same carriage was daily in use between London and Greenwich, conveying numerous passengers through the crowded suburbs of the metropolis without the slightest inconvenience to the public, we were desirous of personally making an experiment of the facility with which a carriage of that description could perform a journey of considerable length; and having selected the mail coach line of the Holyhead road for the purpose of such experiment, we made an arrangement with Sir Charles Dance for the use of his carriage, on Friday the 1st inst.

The weight of the carriage, with the water, coke, and three persons upon it, was about . .	3 tons,	5 cwt.
The weight of the omnibus coach attached to it	1 "	0 "
The weight of the passengers, their luggage, and some additional sacks of coke, about .	1 "	15 "
Making the gross weight moved . . .	6 tons,	0 cwt.

The motive power was an engine with two cylinders, seven inches in diameter and sixteen inches stroke. The pressure of steam on the tubes constituting the boiler, or generator, was not allowed to exceed 100 lbs. per square inch.*

Before the carriage had proceeded six miles, one of the tubes of which Sir Charles Dance's boiler is composed, was found to leak so fast as to render repair absolutely necessary; it was also apparent that the size of the engine was not sufficient to carry so great a weight along a heavy road at any high velocity.

The weather was by no means favourable, there having been much rain in the course of the night and morning, so as to make the road heavy, added to which the winter coating of new materials had, in many places, been laid upon the road. Notwithstanding these obstacles, upon our arrival at Stony Stratford, fifty-two and a half miles from town, it was found by Messrs. Macneill and Carpmael, who had taken accurate minutes of the loss of time occasioned by stoppages, that the average rate of travelling had been seven miles per hour.

* These facts have been ascertained by Mr. Joshua Field, Mr. John Macneill, and Mr. Alexander Gordon, civil engineers.

Thus there can be no doubt, that with a well constructed engine of greater power, a steam carriage conveyance between London and Birmingham at a velocity unattainable by horses, and limited only by safety, might be maintained; and it is our conviction that such a project might be undertaken with great advantage to the public, more particularly if, as might obviously be the case, without interfering with the general use of the road, a portion of it were to be prepared, and kept in a state most suitable for travelling in locomotive steam carriages.

THOMAS TELFORD, President of the Society of Civil Engineers.
JOHN RICKMAN, Secretary and Commissioner of Highland Roads and Bridges.
C. W. PASLEY, Lieut. Col. Commanding the Royal Engineers, Chatham.
BRYAN DONKIN, Civil Engineer.
TIMOTHY BRAMAH, Civil Engineer.
JOHN THOMAS, Civil Engineer.
JOSHUA FIELD, Civil Engineer.
JOHN MACNEILL, Engineer to the Holyhead Roads.
ALEXANDER GORDON, Civil Engineer.
WM. CARPMAEL, Civil Engineer.
J. SIMPSON, Engineer to the Chelsea Water Works.

London November, 1833.

¶ ***On the extensive Atmosphere of Mars. In a letter to his Royal Highness, the*** **DUKE OF SUSSEX,** ***K. G., President of the Royal Society.*** **By SIR JAMES SOUTH, F. R. S. Read before the Royal Society, December 13, 1832.**

Through the kindness of your Royal Highness, I had some time since the honour of calling the attention of astronomers to the "Extensive Atmosphere of Mars"—to the observations of those great men from which its existence was inferred, —and I showed that they were either unsupported by, or were at variance with, my own. Still, however, as the observations, of which mine seemed subversive, were bequeathed us by astronomers, to whom astronomy owes deep and lasting obligations, respect due to their memory, demanded that I should rather enforce the necessity of further observations, than treat the matter as actually decided.

This night has put me in possession of fresh evidence, and I lose no time in forwarding it to your Royal Highness, in the hope that it may have the honour (should you, as President of the Royal Society, think it worthy) of being presented by you for insertion in those journals, which contain so rich a mine of astronomical truths.

During twilight, in the field of the large equatorial, I saw a star of the eighth or seventh magnitude, south preceding the planet Mars; its place (approximately taken with the five feet equatorial) was right ascension, 3 hrs. 29 min. 19 sec., and its northern declination about

20° 22′; as additional identification, it was found to precede a star of the seventh or sixth magnitude, about five minutes, twenty-six seconds and five-tenths, and was about one minute and forty-eight seconds of a degree south of it. These preliminaries settled, the night became cloudy; but at about three hours and a half siderial time, the sky being clear, on directing the instrument to Mars, the planet was seen somewhat more than half a minute from the star. The star, as previously noticed, was of a light blue colour, affording a pleasing contrast with that of the planet, and was tolerably steady; the planet's limb was extremely unsteady. The object glass of the large Equatorial is 11.85 inches in its clear aperture, and has nearly nineteen feet focus. It has two finders, the one a telescope of 4.40 inches aperture, and five feet focal length; the other 2.75 inches diameter, and forty-two inches focus. They are placed parallel with the tube of the large object glass, so that the same siderial object presents itself in the centre of the fields of the three telescopes at the same moment. The object glasses of all the three are very perfect; and taking them in the order of their diameters, beginning with the largest, they were supplied with the powers of 520, 250, and 120; and that the observations might not be vitiated by the unsteadiness of the polar axis, cylinders of wood were placed east and west of the large telescope, so that towards their upper extremities, they rested against that telescope's tube, whilst their lower ends were on the observatory floor. The five feet equatorial also was placed upon the planet with a power of 133 only. With this instrument, the star was seen by one observer, till the planet's limb had reached it; with the large finder of the large equatorial, another observer saw it, till a small segment of its disk had been cut off by the planet's limb; whilst with the small one it was distinguishable when not more than three seconds of a degree distant from it. But although the planet's approach to the star was observed with the several telescopes, it is to the large equatorial only that we must refer, with the reasonable hope of detecting any minute optical change which the star might apparently undergo.

No such phenomenon, however, occurred, for the star retained its light blue colour and comparative steadiness till the very instant of its occultation, which took place at 4 hrs. 32 min. 24.7 sec.; nor did its splendour suffer any diminution prior to disappearance, except what may fairly be attributed to the light of the planet. I saw not the slightest projection of the star upon the planet's disk.

Again, at the emersion, which happened at 4 hrs. 50 min. 41.7 sec. the star, with the large equatorial telescope, was seen neatly dichotomized; with the large finder it was detected before the planets disk had separated from it; by the five feet equatorial, when it was still clinging to it; and by the small finder when it was not more than three seconds distant. With the large telescope it was watched with the greatest attention, at, and for some time subsequent to, the emersion; and I feel confident, that not any thing remarkable occurred, any more than at, and previously to, the emersion. The planet had passed his opposition nine days.

Reflecting on these facts, and on those I have before presented to

your Royal Highness, I can arrive at no other conclusion than that either some physical change has occurred in the "extensive atmosphere of Mars," or that the accuracy of the observations of Cassini and of Roëmer, must be regarded as untenable.

November 29, 1832. [*Trans. of Royal Society.*

¶ *Magnetic Experiments on Chronometers.*

From the Nautical Magazine, No. xv.

Many of our readers will persue with much interest the following account of some experiments communicated by Messrs. Arnold and Dent on the subject of magnetism affecting the balances of chronometers. That magnetism does influence the chronometer has long been supposed, and, in order to obviate its effects, other metals, instead of steel, have been used in the construction of the balance and its spring; but the subject has not hitherto received that attention which its importance demands, and we know of only one series of experiments besides the following, to have been made, with the view of ascertaining to what extent the magnetic force is capable of deranging the performance of this machine. It has been generally admitted by seamen, that a chronometer changes its rate after its removal on board, and preserves what may be designated a sea rate. The subject appears to have been totally neglected before the year 1820, when a paper "On the Errors in Longitude, as determined by Chronometers at Sea, arising from the Action of the Iron in the Ships upon the Chronometers," was drawn up by Mr. George Fisher,* and communicated to the Royal Society in the month of June in that year, by John Barrow, Esq. We will here give the abstract of the paper to which we have alluded:

"The sudden alterations in the rates of chronometers, when taken on board ships, are generally ascribed to the motion of the vessel; but from circumstances connected with the chronometers of the Dorothea and Trent, during the late voyage to the North Pole, the author is induced to refer these alterations to other causes: he found that in all cases the gaining rates were increased, and their losing ones diminished, on ship board. That this accelleration does not arise from the ship's motion, was shown by its occurrence when the Dorothea and Trent were beset with ice, and when they were at anchor close in shore, without any perceptible motion; nor does it appear that change of temperature was at any time the cause of this change of rates. That the iron in ships becomes magnetic is shown by its polarity, the whole forming, as it were a large magnet, having its south pole on deck and its north pole below. The inner rim of the balance of chronometers, which is made of steel, will therefore be liable to magnetic action, which will be sufficient to cause a very sensible alteration in their rate of going.

Mr. Fisher concludes this communication with some account of

* The present Chaplain of H. M. S. Victory

experiments on the action of magnets upon chronometers placed in various positions, with respect to their balances, by which it appears that an accelleration in these cases always ensues. It also appears probable, he observes, that the force of the balance spring is affected by the same cause, since chronometers in which they are made of gold, though more difficult to adjust, keep better rates at sea than others.

"An appendix, containing tables of rates furnished by Mr. Coleman, is annexed to this paper."

Both series of experiments completely corroborate each other, and prove to the seaman the secret and prolific causes of derangement to the good performance of his chronometer, causes which must be ever varying their effects, and which must depend on the situation of the ship, and the direction of her head. In the high latitude in which Mr. Fisher's experiments were made, the deranging effects proceeded from the iron of the ship, independent of the magnetic effects of the earth, which latter must increase and contribute its deranging effect likewise in lower latitudes. To have discovered the means of removing these difficulties by the exclusion of metal entirely from the balance spring, and making other alterations in the balance, which Messrs. Arnold and Dent have effected, must be considered as the greatest improvement which the chronometer has received since it was invented,—an improvement which will contribute to the protection of life and property, and the advancement of geography.

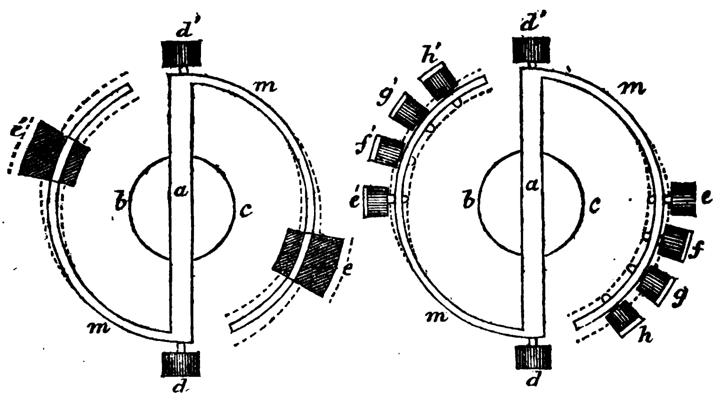
To the Editor of the Nautical Magazine.

84, Strand, 11th April, 1833.

Sir,—We are enabled at length to perform our promise of furnishing you with a detailed account of our Chronometrical experiments with the magnet, that have been made at the Royal Observatory at Greenwich during the last few weeks, and to which you alluded in your Magazine for February last. The remarks which were then made on the subject of our chronometers, were designed chiefly to explain that we had taken upon ourselves to examine "de novo," the entire theory of those valuable machines, with a view not only to simplify the construction of that most important member, the balance, which neither theory nor practice have as yet been able to rescue from the complication of difficulties which result from its present state; but also, as a necessary consequence to our success in this particular, to lessen the great price which has hitherto been demanded for chronometers, and thus to remove a principal obstacle to their more general employment in the Royal Navy. As far as we had then proceeded, our wishes had been fully realized by our having actually produced a very material reduction in them of one-third of their former price, and as many of your readers will be anxious to learn the cause of such an alteration, we venture to offer you the following explanation of it, and to enter more fully into the improvements which we have lately introduced in the balance and other parts of the chronometer.

The principal feature of our last experiments consisted in the trial of a balance of an entirely new construction, in several chronometers, the rates of which were recorded in your 12th number. This balance was constructed by Mr. Arnold some years since; in fact, the first trial made of its merits was with chronometer No. 521, the rates of which were particularly mentioned by you in your paper before alluded to. The balance constructed on the old principle was considered by Mr. Arnold to be defective in many respects. One or two of its most obvious objections may be more plainly shown, by referring to the annexed figures, which represent the two forms in which the balance is at present made.

Fig. 1. *Fig.* 2.



In both figures, the letter *a* distinguishes the arm of the balance, *composed of steel.*

Through the centre of these arms pass the verges or axes, round which, as is seen in the figures, are coiled the balance springs *b*, *c*. The lamina of brass and steel for the compensation are shown at *m*. the inner circle being of steel and the outer one of brass. In fig. 1, *d* and *d′* represent respectively the timing screws for the six and twelve hours; the sliding weights *e* and *e′* are for the compensation. Now, if any alteration be requisite for the timing of the positions, &c., it is effected by reducing a small portion from these weights, a process which is necessarily attended with much inconvenience, as the balance must be entirely removed from the chronometer before such alteration can be made; and, moreover, the compensation for temperature is thereby disturbed.

Fig. 2 differs from the former, in the screws *e* and *e′* being entirely used for correcting the vibrations on mean time in the different positions, while the screws *f*, *g*, and *h*, and *f′*, *g*, and *h*, are used solely for temperature. The process of compensation in this balance is more simple and convenient than in fig. 1. A number of small holes being made in the lamina, the several screws are moved so as

to form greater or less angles as the adjustments for temperature may require. In both figures the balances are represented as at the time when the perfect adjustments for compensation, &c., have been applied; the broken lines in each show the variation of figure, the interior being that which they assume in heat, and the exterior that in cold, when under any great extreme of temperature. This deviation in the balance from the true figure of a circle may disturb its centre of gravity, as the lamina of the balance, their screws and weight evidently contract and expand unequally to and from the centre. Moreover, the balance is thus powerfully influenced by centrifugal force.

The explanation of our patent balance we must leave for a future opportunity, the subject being of so much importance that we should necessarily occupy more of your attention than would be reasonable. We will merely state that the objections which we have here pointed out, are entirely removed by this new balance.

Your readers will be able to judge from the rates of the chronometers in your 10th number, how far this alteration in the balance is worthy to be considered as an improvement. It must not be forgotten, that inquiry has but now commenced, and that perfection, or any approximation thereto, must be the work of time.

We will now proceed to lay before you the final experiments which we have made, with a view to ascertain the magnetic influence on the chronometers.

Several reasons suggested themselves, to render this question important.

In the first place, we have repeatedly found that a very considerable change takes place in the rate of our chronometers, on removing them from our house to the Royal Observatory for trial. We do not mean to quibble about two or three tenths of a second, because the removal of them from one place to another might have a tendency to produce for a time errors of this magnitude. But we now allude to one or two seconds deviation in rates, which it must be allowed are tangible quantities. Now, in the carriage of a chronometer from London to Greenwich, by some horizontal motion accidentally given, a discrepancy of one or two seconds in the *actual error* of the chronometer may be produced; but by experiments it is found that any casual accellerations in the vibration of the balance produce no permanent injury to the rate when the equilibrium is restored. We have known many instances (and we are not singular in our observation) where, assuming the mean rate of a chronometer in the Strand to be 3s,0 per diem, the removal to Greenwich has produced an immediate and constant rate of 4s. or 5s. per diem. The same may be said of the removal of chronometers from Greenwich to the Strand.

We are of course founding our remarks on observations made on the very best of our chronometers, where anomalies of this nature are too striking to be disregarded.

We are enabled from the public documents of the Royal Observatory relating to chronometers, to produce two or three instances of

effects of this nature, to which we refer, having taken place on the removal of the chronometer from Greenwich to other places. We give the mean weekly rates before and after removal of three chronometers by various makers:—

— 4s,5 5 ,1 4 ,4 4 ,1	— 0s,9 1 ,1 0 ,9 1 ,4	— 4s,5 4 ,2 3 ,9 4 ,1	At the Royal Observatory.
— 1 ,4 1 ,4 0 ,9 0 ,9	+ 2 ,6 2 ,8 3 ,0 3 ,1	— 6 ,1 6 ,6 7 ,5	Elsewhere, immediately after removal.

But we will carry this subject still further. What we have above stated will, doubtless, by some be objected to on the score of the possibility of derangement from carriage from one place to another. We will now state a fact which cannot be opposed by the same argument.

Let a chronometer be so placed that the six hours of the dial be turned towards the north point of the horizon, and the twelve hours towards the south, so that a line drawn from six to twelve is in the line of the magnetic meridian of the place; hence a line drawn through the nine and three hours will pass through the east and west parts of the horizon respectively. Now, if the chronometer be rigidly kept in this position for some days unmoved, which, by a little contrivance, may be easily affected, a mean rate may be obtained; and if the chronometer be then turned in azimuth 180°, so that the twelve hours and six hours point, respectively, to the opposite points to which they did before—the three and nine hours to the east and west, respectively—the mean rate derived from it in this position will vary materially from the former rate. Again, if we obtain a mean rate from the chronometer when the twelve and six hours point, respectively, to the east and west, a third result will be obtained, differing from the two former so as to become a mean between them: and, lastly, by reversing the positions again in azimuth as we did the north and south, we shall have a result quite analogous to the last.

We do not, however, pretend to assert that the change in the rate of the chronometer is so extensive, or so discernible from these latter experiments, as in the case of a removal of the machine from Greenwich to London; the circumstances are very different, and a different result is produced.

But the most remarkable effect attending the removal of the chronometer is that produced on going from the maker to the ship. It is also the most important one, because if magnetism really produces an effect on the rate of a chronometer, its proximity to large masses of iron, &c. being unavoidable on board a ship; the evil is then more severely felt, when not only natural magnetism operates, but its most

potent auxiliaries, in the shape of the iron work on board, &c., present so powerful an artificial magnet.

The polarity that exists in the iron which is to be found in every part of a ship is to be descried by the constant deviation of the north end of the compass when placed on deck, towards the centre of the ship.

A remarkable instance of the effect produced by the removal of a chronometer to a ship, occurred in the case of one of our chronometers, Dent No. 114, which, having established its fame at the Royal Observatory by gaining the first prize in the year 1829, was shortly after removed to His Majesty's ship Blossom, commanded by Captain R. Owen: no sooner was it on board, than it immediately altered its rate from 3s,96 to 5s,0 per diem, and preserved it with great satisfaction to all parties.

The foregoing are the principal reasons which induced us to refer the greater part of the evils which now affect the balance of a chronometer, to the effect of magnetism. The balance, according to its present construction, as we have before stated, is mostly composed of steel. The arm *is one solid mass of steel*, and a tolerably thick circle of the same metal forms the inner part of the lamina for the compensation. The balance spring is also entirely formed of steel, so that, on the whole, a considerable quantity of this metal is introduced into a chronometer. The first experiment we made to investigate our theory of the magnetic influence on it, consisted in removing a balance from one of our old chronometers, which had shown symptoms of fluctuation of rate in different positions, and suspending it by a very fine fibre of sufficient length, that the force of tension might be destroyed, at the same time taking special care to guard it from any current of air which might convey to it a rotatory motion, by covering it with a glass frame.

This experiment was gratifying in the extreme, and at once confirmed our opinion of the existence of a *polarity* in the balance. We afterwards suspended several balances in the same manner, and in every instance, the results were entirely as we had anticipated. The balance, in fact, performed in every respect the functions of a magnetic needle, one end of it assuming the character of the north pole, the other that of the south. The application of an artificial magnet, caused effects quite analogous to those which would have been produced with the needle.

We must here make a necessary digression from our subject, for the purpose of endeavouring to account for the phenomena of a polarity having been induced in the balance. The natural attraction of masses of steel and iron is one of those secrets of nature which no philosophy has yet been able to penetrate, and the mystery is equally as great in the case of the polarisation of metals. But, although we cannot explain the cause of these natural facts, we know from experience that the effects are very easily produced by artificial means.

Thus, if a bar of steel, hard, tempered, and apparently unmagnetized, be held in a position forming a slight angle with the vertical, so as to coincide nearly with the axis of the earth, and while in this

position it shall receive several blows from a hammer, it will have acquired all the properties of a magnetic needle. Now, in the mechanism of the arm of the balance, the very force which the artist employs in polishing it, together with the friction which it undergoes in working, may have a direct tendency to induce a polarity, so that there can be but little doubt that before the balance comes out of the hands of the workman, the evil is already accomplished.

To return now to our last mentioned experiment. Having quite satisfied ourselves of the existence of a polarity in the balance, we next endeavoured to ascertain the relative magnetic influence exerted on different balances, constructed apparently on like principles, and of like dimensions. We accordingly set two balances oscillating at an angle of thirty-five degrees from the magnetic meridian, and when this angle had decreased to thirty degrees, the time occupied in each ten successive vibrations were accurately registered till the angle had decreased to ten degrees. We found, however, but little difference in the comparative effects produced by magnetism on them; but, as might be expected, the smaller the arm of the balance was, the more conspicuously was the magnetic force exerted, and the fewer the vibrations requisite to restore it to its natural position.

Our whole attention was now turned to devise a method by which the evils that manifested themselves so clearly might be obviated. The entire removal of all magnetical susbtances in the construction of the chronometer became indispensable, but the task was far more difficult than can at first be conceived. In the spring, for instance, the substitution of gold for steel is natural enough, but the danger of doing so is very great.

We have already discussed this subject in your last number, to which we beg to refer your readers.

It may, however, be proper to add, that the discovery of the use of glass for a spring, which we there noticed, did not take place till after the experiments which we are now explaining were nearly completed. We could not, therefore connect the trial of the glass spring with those experiments. The springs we have used in the experimental chronometers in which we wished to avoid steel, have been made of gold, with an alloy of copper and silver, and to all appearances, we have succeeded in making such a compound of these metals that the frangibility of the spring is very much reduced. A great deal yet remains to be done in this respect, although we have every confidence in the final success of our glass spring, which will supersede the use of metals altogether.

Some little difficulty attended the alteration requisite to be made in the balance. The arm of our patent balance is composed of platinum and silver, and the two perpendicular screws are of brass, as well as the weights and timing screws.

Our first wish was to suspend this new balance in the same mode as we had done the old one, and the result of the experiment was highly satisfactory. In the first place, it assumed no fixed position as the former one had done, but stood suspended in any horizontal position in which it was placed. The interference of the magnet did not in-

dicate the existence of any attraction between it and the balance, although at times we were disposed to alter our opinion on this point. We do not, however, for a moment doubt the susceptibility of all metallic bodies to become magnetic. In fact, from experiments which we have made, connected, though indirectly, with the present subject, we are quite convinced that every metal may be said to possess a certain degree of inherent magnetism.

In a future part of this paper, we shall produce important evidence of the truth of this theory, at all events, as regards brass, platinum, and silver.

[TO BE CONTINUED.]

Observations on the Circumstances producing Ignition in Charcoal, in Atmospheric Temperatures. By Mr. William Hadfield.*

The spontaneous combustion of charcoal under certain circumstances has been long observed, though it has not excited the attention which it merits; nor would it now, perhaps, have possessed much general interest, had it not been for the serious consequences which may result from its occurrence in some situations. As large quantities of charcoal are used in gunpowder manufactories and in other works, its spontaneous combustion in many places would manifestly endanger, not only much property, but a number of lives. The subject is therefore worthy of attention, since, if the cause could be assigned, the danger might be averted.

Engaged during twenty-five years in a manufactory where charcoal is produced, I have had many opportunities of observing the phenomenon; and I have been induced, by the suggestions of a number of my friends, to lay the amount of my own experience before this Society.

Though I am aware that a very interesting article on this subject was, in January last, published by Col. Aubert in the "Bulletin des Sciences Militaires," I shall abstain from any further notice of it, since I wish to confine my present paper to the result of my own observation and experiments.

If twenty or thirty hundred weig tof charcoal, in a state of minute division, be put together in a heap, and remain undisturbed, spontaneous combustion generally ensues. The fact has been long known, but no investigation, with the exception of that to which I have referred, has, to my knowledge, been instituted.

Spontaneous combustion does not often take place in what the manufacturers call *round charcoal;* that is to say, in fragments of considerable size; unless when large quantities are laid together, under which circumstances it is not very unusual. In this case, the phenomenon is generally ascribed by the makers to the charcoal not having been sufficiently cooled after its production. This reason is,

* Read before a meeting of the Literary and Philosophical Society of Manchester, on November 4, 1831; and now communicated by the author.

no doubt, sometimes, but not always, correct. On the contrary, I have known charcoal, which has been freely exposed to the atmosphere for several days, enter into a state of ignition, when, though closely watched, it presented in the interval no appearance of the kind.

In one case, charcoal was loaded in Manchester, and conveyed by a cart to the distance of twenty miles. No combustion appeared during the loading, nor could the carter, though he carefully examined, perceive any indication of it, when, at eleven o'clock, he left it for the night. At five o'clock on the following morning, however, he was called up to save his cart, which he found on fire, and nearly consumed.

This charcoal had been made three days before the accident. Care had been taken that it should be sufficiently cool before it was loaded, as a similar event had previously occurred to the same parties, who ascribed it to the charcoal being too new, when, as they conceived, fire lurked in it unextinguished.

These two instances may, I should think, be accounted for in the following manner:—

When large quantities of charcoal, as in the first example, are laid together, it is evident that the lower parts must be exposed to pressure, and, by the motion of the cart, to friction from the parts above; in this way, therefore, a portion of the charcoal is pulverized, forming a compact mass at the bottom, where it enters into spontaneous combustion.

In the second instance, pressure and friction had still greater influence. The carter, while he was loading, beat down the charcoal with a large hammer, to force it into a smaller compass. Conveyed for twenty miles in a cart, the pieces would rub against each other, and the finer parts would be shaken to a compact mass; and possibly the friction might in this case particularly, produce a degree of heat which would promote the ignition.

Before I proceed to an account of my own direct experiments, I will describe here another instance of spontaneous combustion which occurred casually. About 2000 lbs. weight of charcoal were loaded at Cornbrook, in the cart of Messrs. Williamson & Co.. powder-manufacturers of Fernelee, near Buxton. The charcoal had been made several days before, and had lain freely exposed to the open air. No indications of combustion could be perceived. After being taken out of the cart at Fernelee, it was left for the night, and the next day finely pulverized, as a preparation for making gunpowder. It was then thrown into a heap; and no appearance of a tendency to ignite ensued. This was on the Saturday evening; and on Sunday, the building which contained it was observed to be on fire. The fire must have commenced with the charcoal, as every other source of heat was carefully excluded, on account of the gunpowder manufactory.

These, and a number of other accidents which have arisen from the same cause, united with the opportunities which I have possessed

as a manufacturer of charcoal, have led me to take particular interest in the subject.

Colonel Aubert's paper, which I have already alluded to, and an abridged translation of which appeared in Dr. Brewster's Journal for April last, 1831, placed the subject in so striking a point of view, that I came to the determination of making, for my own satisfaction, a few experiments, which I shall proceed to describe.

Exp't. 1.—120 pounds of charcoal, slightly pulverized, were put into a flour barrel, and a leaden tube, of an inch and a half in diameter, and fourteen inches long, inserted in the middle, to hold a thermometer. The temperature of the charcoal when put into the barrel was sixty degrees. In two days the charcoal acquired a temperature of seventy degrees; from that time the temperature gradually diminished until, in two days more, it was reduced again to sixty degrees, —the temperature of the surrounding atmosphere. This charcoal was rather old, having been made several weeks, and afterwards freely exposed to the open air.

Exp't. 2.—120 pounds of fresh charcoal, pulverized as before, were put into the vessel used in the preceding experiment. The charcoal was then at 70°, and the surrounding air at 62°. In twenty-four hours it had acquired a temperature of 90°; in thirty-six hours, of 110°; and in forty-eight hours more it was down to 70°, as at the commencement.

Exp't. 3.—The same quantity of charcoal was taken as in the foregoing experiments: it was quite fresh, and ground into coarse powder. In thirty-six hours the temperature was 130°; it then gradually declined to 70°, when the experiment was given up.

From the preceding experiments I was satisfied that spontaneous combustion would not take place in so small a quantity. I therefore determined to make the experiment upon a larger scale.

Exp't. 4.—10 cwt. of new charcoal was finely ground, and put into a hogshead, with a thermometer placed, as before, in a leaden pipe. Several holes were bored in the sides of the hogshead to admit the air. The charcoal, when ground, was 65°; and particular care was taken in examining the charcoal, to see that it was free from ignition. It was put into the hogshead at about ten o'clock in the morning, and at night, its temperature had risen to 90°; the following morning, to 150°; and in the afternoon of the second day, the thermometer stood at 180°.

I was surprised to find at this time that combustion had taken place at about five or six inches from the surface, and about the same distance from the leaden pipe which contained the thermometer, though the temperature, as indicated by the thermometer, was only 180° or 190°.

It may perhaps be proper to remark, that the combustion always takes place *near* to the surface; or, if small charcoal be laid against a wall, the combustion generally begins either at the surface, or close to the wall.

On the 13th of October, 1831, small charcoal was thrown into a heap, which covered about ten feet square, was about four feet deep,

and contained from two to three tons in weight. In three days the temperatare had increased to 90°, though it was at first only 57°, being the same as that of the air. On the 19th, it was 150°, and on the 20th, combustion had occurred in several places. Water was thrown upon it, and the combustion was, to all appearance, effectually extinguished; yet, on the 21st, it was again observed to be burning in different parts; and it continued to burn until it was removed and formed into smaller heaps.

The last experiment was the most satisfactory one which has ever come under my notice. The charcoal had been made for at least ten or twelve days before it was put together; and had been lying, during the interval, in small heaps freely exposed in the open air.

I am not aware that any experiment has been made to ascertain the effect of the exposure of the charcoal to pure oxygen gas. A bell glass, of the capacity of two quarts, was filled with oxygen gas previously freed from carbonic acid by washing with lime water. In this vessel was placed a glass dish, containing an ounce of finely pulverized charcoal. The charcoal was left to stand in the oxygen for twenty-four hours, and at the expiration of that time, no trace of carbonic acid was to be found on passing the remaining gas through lime water.

This experiment was three times performed in the same manner, and with precisely the same result.

I have here given a brief and simple statement of the observations and experiments which I have yet made upon this curious and interesting subject. The spontaneous combustion of charcoal is, I apprehend, now fully established: and I have endeavoured, to the best of my ability, to determine some of the circumstances under which it takes place. I have abstained from any theoretical speculations; contented, for the present, to have related the facts which experiments alone have elicited. If in future any new facts should present themselves, I shall be happy to submit them to the Society.

[*Phil. Mag.*

Pressure of the Ocean.

In those accustomed to the Greenland whale fishery, the immense pressure of the ocean cannot but have excited much astonishment and curiosity. In the common method of capturing whales, it is customary to strike them, at first, by a harpoon, an instrument well known to the sailors, with a stock or handle of fir, ash, or hickory, with a line of a very considerable length attached to it; and as soon as struck, the whale generally descends, nearly as quick as a bird, to a very great depth, taking the harpoon along with him, buried to the depth of twelve or eighteen inches in his body, while the other end of the line is particularly coiled in the boat, and veered out by the harpooner with much caution and dexterity. It sometimes happens that the whole of the first boat's line, though no less than 1080 fathoms long, will be taken under water in a very few minutes; and

if another boat be not near for the harpooner to fasten the end of another line to the end of his own, the whale must be suffered either to go away with the line, or else with both boat and line; the latter method can only be taken when a convenient piece of ice is at hand for the preservation of the boat's crew. And it has too frequently happened, that the line has got entangled in the boat, in consequence of which the whale has taken it completely under water along with her, and given the whole, or most, of the crew, a watery grave. During my career, I have twice experienced this misfortune, having had the boat taken twice from under my feet; and at another time a whale cut my boat completely in two with his tail. During the absence of the whale under the water, many boats are collected around, waiting his return to the surface, when he is immediately struck by another, or perhaps two harpoons, and then descends again the same as before, put probably not a tenth part so far as at first, ere he is obliged to return again to the surface to breathe. He is then struck with lances, instruments with a blade and shank from four to six feet long, which are thrust to the same distance into his body, and which makes the blood spout out in torrents. One or two good lances, directed to proper parts of the body, speedily put an end to his existence, when he immediately turns on his back, and lies flat on the surface of the water,

It had long occurred to me, that when the harpoons were taken out of the new killed whales, they were much heavier than usual; and that they were obliged to be hung up in the galley, (the place for cooking,) before a large fire for several days, before they could, at any rate, be made use of again; nor were they, after this long exposure to heat, near so light and handy as at first. This had frequently attracted my notice, without any further investigation of its cause, until the year 1820, on board the ship Harmony, of Whitby, when, after capturing a whale in the usual manner, I observed a harpoon stock, which was broken close to the socket, and which I believe was of fir, drop into the water, and immediately sink like a stone. This excited my curiosity afresh, and I determined to examine more minutely the several harpoon stocks which had been taken down by whales to similar depths; and on cutting then in two with a saw, I found that of whatever kind of wood they were made, they were as completely soaked in every pore, to the very heart, as if they had lain at the bottom of the sea since the creation of all things! and even some of them were cracked and fissured in different places. Besides, their surfaces were invariably covered with small air bubbles, like froth, for a considerable time after they had risen above the surface of the sea.

I also corked and sealed an empty quart bottle, and sent it down with the marine diver to the depth of 100 fathoms; and when drawn up, the cork was found in the inside of the bottle. I then made another cork, rather too large for the bottle, knocked it in with a mallet as far as I could for fear of breaking the bottle, which, being sent down to the depth of 100 fathoms, was found to be pushed in; and it is very probable that had the cork been sufficient to resist the pres-

sure, the bottle would have been crushed to atoms. However surprising this may appear, all astonishment must necessarily vanish when we consider the immense pressure which must of necessity take place on every part of the surface of a body immersed under such a vast column of water: such a pressure as no vacuities, however strongly protected, can resist.

The pressure on the bottle, consisting of only 85.215 square inches of surface, at the depth of 100 fathoms, is found by calculation to be no less than 10 tons, 9 cwt. 1 qr. 13 lbs., and that on the cork 15 stone, 6 lb. 2 oz. And at the depth of 900 fathoms, or 5400 feet, the pressure on every square foot of surface, will be $5400 + 34 \times 1000$ oz. $=$ 5434000 oz. $=$ 151 tons, 12 cwt. 1 qr. 13 lb.

THOS. BEVERLY.

[*Nautical Magazine.*

¶ *Influence of Colours on the Absorption of Heat, and of Odorous Principles.*

On the 20th of June, 1833, a paper was read before the Royal Society, "On the influence of Colour on Heat and Odours;" by James Stark, M. D. of Edinburgh, of which the following is an abstract—

The author observes, that the only experiments on record relating to the modifying effect of different colours on the absorption of heat from solar light, are those of Franklin and Sir H. Davy. In order to investigate this subject, the author employed pieces of wood, silk, and cotton, which were wrapped round the bulb of a thermometer placed in a glass tube; the tube was then plunged into boiling water, and the time which elapsed during the rise of the thermometer from one given point to another, was accurately noted. Other experiments were also made with an air thermometer, of which the bulb was coated with various coloured materials, and heat thrown on the ball by means of polished tin reflectors from an Argand burner. The results accord very nearly with those of Franklin and of Davy, the absorbing power with regard to different colours, being nearly uniformly in the order of black, brown, green, red, yellow, and white. The author next investigates the differences which occur in the radiation of heat by differently coloured substances, a subject on which he is not aware that any experiments have ever been made previously to his own. The mode of ascertaining the amount of radiation was generally the converse of that by which the absorption of heat had been determined; namely, by exposing the coloured substances, in contact with a thermometer, to cooling instead of heating processes. The general result of all his experiments was, that the loss of caloric by radiation follows exactly the same order, with regard to the colour of the radiating surface, as its absorption. In the second part of this paper, the author gives an account of a course of experiments which he made with a view to discover the influence of colour on the absorption of odorous effluvia, and more especially in the case of the

absorption of the fumes of camphor and assafœtida by woollen cloth of different colours. Black cloth was always found to be possessed of the greatest absorbing powers, and white of the least; red cloth being intermediate between them. Cottons and silks gave, on trial, precisely the same results, which were further confirmed by the different weights acquired by these substances from the deposition of camphor upon them.—*Proceedings of Royal Society.*

[*Rep. Pat. Inv.*

¶ *Method of Dressing Skins, practiced in Marocco.*

The following account of the method of dressing skins in Marocco, was transmitted to the Zoological Society by W. Willshire, Esq., a corresponding member of that Society, in a letter dated Mogadore, May 5, 1833. Its results are stated to be excellent, as regards the preservation and colour of the fur, and the flexibility of the pelt.

Wash the skin in fresh water to deprive it of the salt; as soon as this is done, scrape the flesh off, when take two pounds of alum, one quart of buttermilk, and two or three handfuls of barley meal, which mix well together, and lay on the fleshy side of the skin equally; fold up and press it together carefully, and let it lie two days. On the third day take it to the sea side, wash the skin well, and when clean and free from the mixture, hang it up to let the water run from it; then take two pounds of alum finely powdered, and throw or spread it equally on all parts of the skin; again fold it up as before, and allow it to lie three days, when it will be in a proper state to dry in the sun, laid flat, without taking away the powder. When it is dry, take a pint or two of fresh water, and sprinkle it upon the skin, and again fold it up carefully for about two hours, to imbibe the water; then lay it upon a table, and after scraping it free from the mixture and flesh, take a sand stone (rather rough) and rub the skin well until it becomes soft and pliable, then hang it in the shade to dry. The process is then complete.

When the skin is perfect, having the head, horns, &c., take off the horns, and fill their cavity with a mixture of equal parts of powdered alum and ashes of charcoal dissolved in water, and expose them two days to the sun. Saturate the trunks of the horns in eight ounces of alum dissolved in water, and fold up with the skin, and apply the same on each occasion when employed in curing the skin. The flesh on the head and jaws to be carefully taken off, filling the same with powdered alum. It should remain in the sun until perfectly dry.

In addition to the foregoing description of the mode used in Marocco, in dressing skins, as related by the persons employed by Mr. Willshire, it may be well to observe, that the process does not take so long at Mogadore, as Mr. W. has often received back skins of the Aoudad and Leopard from the dresser, on the third or fourth, and never exceeding the fifth day, perfectly cured. Allowance has been made by the dresser, in the foregoing description, for the difference in the climate of London.

The skins of smaller animals must not be subjected to so lengthened a process, or they will become harsh and the pelt impoverished—*Proceedings of Zool. Soc.* [*Ibid.*

¶ *Polishing Powder.*

Certain of the French manufacturers of polishing powder, use in their manufacture scraps of old iron, which they put into a tub, and cause to rust quickly by sprinkling with water.

When a sufficient quantity of rust has thus been formed, it is collected by washing, and after allowing it to settle, it is dried and calcined in a crucible.

The longer the calcination is continued, the more the oxide approaches to a violet hue, and the harder its grain. At a very high temperature, the oxide is partly reduced, its colour becomes more gray, and the grain is too hard for polishing.

The red oxide serves for polishing gold and silver, the violet oxide is fit for polishing steel.

When taken out of the crucible it is first triturated, and then levigated, in order to collect the finest parts. [*Ibid.*

CELESTIAL PHENOMENA, FOR APRIL, 1834.
Calculated by S. C. Walker.

D.	H.	M.	S.				
2	5	59	33.5	Em.	♃	2 Sat.	
9	8	35	30.5	Em.	♃	2 Sat.	
10	7	35		♃	☌	☽ ♃ North 3°.	
10	16	42		☿	Stationary.		
11	5			♂	☌	λ Aquarii ♂ South 1°.	
14	7	10		Im.	3	Geminorum,	6, N 65° V120°
14	7	48		Im.	4	Geminorum,	7, N 32° V330°
14	8	17		Em.	3	Geminorum,	6, N297° V354°
14	8	30		Em.	4	Geminorum,	7, N 87° V 27°
16	7	58		Im.	9μ′	Cancri,	6, N167° V210°
16	8	28		Em.	9μ′	Cancri,	6, N219° V273°
18	8	56		Im.	(240)	Leonis,	7, N116° V131°
18	10	08		Em.	(240)	Leonis,	7, N296° V337°
22	7	15		Im.	88	Virginis,	7, N101° V 47°
22	8	20		Em.	88	Virginis,	7, N321° V284°
22	15	35		N. App.	☽ and (270) Virginis, 7. ☽ S. 4′.		
22	23	7		♀	☌	♃ ♃ South 32′.	
25	1	29		☿	greatest elong. West 27°.		

¶ *Removal of a Steeple.*

The Genoa Gazettee contains an account of the removal of a church steeple entire at Crescentino, in Piedmont, from one point to another, at several yards distance, where it was placed on a new foundation. The master mason was so confident of success, that he made his son remain in the steeple ringing the bell during the operation.

Meteorological Observations for January, 1834.

Moon.	Days	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	33°	36°	29.85	29.95	W.	Moderate.		Lightly cloudy.
☽	2	31	39	.75	.75	SE.	do.		Drizzle—thick fog.
	3	24	21	.95	30.10	W.	Blustering		Flying clouds.
	4	14	19	30.33	.35	W.	Moderate.		Clear—cloudy.
	5	15	21	.20	.12	NE.	do.	0.25	Light fall of snow—cloudy.
	6	13	23	.10	29.95	N.	Calm.		Cloudy—snow.
	7	10	23	29.65	.85	W. SW.	do.		Clear day.
	8	24	38	.85	.90	SW. W.	do.		Lightly cloudy—clear.
⊗	9	15	33	30.15	30.20	W. S.	Moderate.		Clear day.
	10	30	39	.15	.10	W. S.	do.		Drizzle—clear.
	11	32	34	.00	29.85	SE.	do.	0.65	Drizzle—rain.
	12	22	32	29.65	.50	SE.	do.		Drizzle—sleet.
	13	31	29	.85	30.05	W.	Blustering		Flying clouds.
	14	22	34	30.20	.20	W.	Moderate.		Lightly cloudy—clear.
	15	23	32	.35	.45	NW.	do.		Clear day.
	16	20	34	.50	.50	NW. W.	do.		Clear—light clouds.
☾	17	33	45	.20	.00	SW.	Blustering		Rain—cloudy.
	18	47	59	29.85	29.85	W.	do.	0.05	Foggy—flying clouds.
	19	39	43	.94	.85	NE.	Moderate.	0.10	Cloudy—drizzle.
	20	38	42	.75	.75	W.	Blustering		Cloudy—snow in the night.
	21	20	25	.90	30.00	NNW.	do.		Cloudy—clear.
	22	17	24	30.16	.20	NW.	do.		Clear day.
	23	12	27	.20	.90	W.	Moderate,		Clear—lightly cloudy.
	24	29	34	.10	.15	W.	do.		Lightly cloudy—clear.
☺	25	12	22	.30	.20	E.	do.		Clear—cloudy.
	26	30	34	.00	29.50	W.	Blustering		Snow squalls—cloudy.
	27	16	22	29.80	.80	W.	do.		Cloudy—clear.
	28	12	27	30.00	30.00	W.	Moderate.		Clear day.
	29	22	32	.25	.45	W.	do.		Clear day.
	30	29	38	.45	.20	SE.	do.		Lightly cloudy—cloudy.
☽	31	32	42	29.95	29.95	NW. W.	do.		Lightly cloudy—hazy.
	Mean	24.10	32.35	30.04	30.03			1.05	

	Thermometer.	Barometer.
Maximum height during the month,	59. on 18th.	30.50 on 16th.
Minimum do.	10. on 7th.	29.50 on 12th. and 26th.
Mean do.	28.22	30.03

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS

APRIL, 1834.

Contribution to the early History of Paper Making in the United States.

We have obtained from Mr. Isaac Sanderson, the present proprietor of the paper mill in Milton, Massachusetts, the following document, giving the origin and progress of the first paper mill established in Massachusetts, and should be pleased with corresponding contributions to the early history of this, or any other, branch of the mechanic arts, in our country.

Com. Pub.

Letter from Mr. John Boies, former proprietor of the Paper Mill in Milton, Massachusetts.

Sir,—In the office of the Secretary of the Commonwealth of Massachusetts, kept in the State House in Boston, in the court (legislative) record for 1730, page 154, is recorded an Act for the encouragement of the first paper mill, built in New England, passed September 13th, 1728, granting a patent unto Daniel Henchman, Gillam Phillips, Benjamin Faneuil, Thomas Hancock, and Henry Dering, for the sole manufacturing of paper for ten years, on the following conditions, viz.—

"In the first fifteen months, to make one hundred and forty reams of brown paper, and sixty reams of printing paper.

"The second year to make fifty reams of writing ditto, in addition to the first mentioned quantity.

"The third year, and afterwards yearly, to make twenty-five reams of a superior quality of writing paper, in addition to the former mentioned, the total annual produce of the various qualities, not to be less than 500 reams a year."

The act passed both houses, and was signed by William Burnett, Governor.

The aforementioned proprietors erected a small paper mill in Milton (now county of Norfolk,) on a site adjoining Neponset river, near the lower bridge, usually so called, where the salt water flows and stops it six hours out of every twenty-four. What number of years the original proprietors carried it on, is now not known; their master workman's name was Henry Woodman, an Englishman; he married in Milton, and left some children; two daughters, Abigail and Rebecca, I have often seen in the early part of my life.

The paper mill having been stopt for sometime, was eventually sold to Mr. Jeremiah Smith, who for want of workmen was prevented from making any use of it. In 1760 the business was again revived by James Boies, of Boston, he having procured a paper maker from a British regiment then stationed in Boston, by the name of Hazelton, who obtained a furlough long enough to set the mill to work. There was an American paper maker, Abijah Smith, then living in Milton, who assisted him; he was a decent workman, and continued at the business until an advanced age. On the regiment which Hazelton belonged to being ordered to Quebec, the Commander in Chief would not permit him to remain behind, and on the plains of Abraham, when the brave Wolf fell, he received a mortal wound, and died a few weeks after. A short interval then took place ere a Mr. Richard Clarke, an Englishman, arrived from New York, and again set the mill at work; he was undoubtedly, taking the whole together, better acquainted with the paper making business than any other European who had made his appearance here; he made most of the moulds he had occasion for. A few years after this, his son, George Clarke, aged about nineteen or twenty years, came to this country, who was also a clever man, and a good workman.

I have thus endeavoured to give you a general account of the commencement of our business, which I hope may afford you some satisfaction; there is no doubt but the paper mill first built in Milton, was previous to any other on this side of Philadelphia, if not the first in America, but that circumstance I presume you can easily ascertain by your connexion in that quarter.

Any thing further you may wish to know respecting this business, if in my power, you may freely command from

Your humble servant,

JOHN BOIES.

New method of Softening Cast Iron.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Having for the first time noticed an article under the above title, published in this Journal, No. 4. vol. iv, 1827, with the editor's re-

marks thereon, I am led to believe that less is known of the effects of alkali, applied to metals, particularly cast iron, in a heated state, than I had before supposed. The bottoms of pots used in making potash, and the ends of cast iron fire dogs, it is well known become very soft after having been some time in use. In 1824, I was well, and practically, acquainted with various methods of annealing, or softening hard cast iron, by the aid of brown sugar, soap, lime, &c., when it occurred to me to try common potash, which I did in the following manner:—The casting was a box for a mill gudgeon, weighing about six pounds, so very hard, that a good cast steel drill would have no effect upon it; it was heated in a common anthracite coal fire scarcely red, in which state it was bathed or washed with a strong solution of potash, when it was again placed in the fire, and allowed to remain till very hot, near fusion: it was then taken out and suffered to cool, after which not the least difficulty was experienced in drilling. This method of annealing, or softening, cast iron, I have seen successfully practised at the B. I. Cos. Works, for eight years, on castings of from 1 to a 100 lbs. and in every variety of shape. It is sometimes found necessary to repeat the operation when the casting is thick, and required to be softened quite through.

I have observed that chilled iron, that is, iron cast in metallic moulds, and consequently extremely hard and brittle, is much more readily and effectually softened than iron cast in sand, the cause of which I cannot satisfactorily explain.

Yours respectfully,
P. M.

Philadelphia, March 12, 1834.

An account of some Experiments made with Mr. Jos. Saxton's Electro-Magnetic Machine. By Jacob Green, *M. D., Prof. of Chem. in Jefferson Medical College.*

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Since the publication of Mr. Saxton's electro-magnetic machine, contained in the last number of the Journal, Mr. Isaiah Lukens, with his usual ingenuity, has converted the immense artificial magnet belonging to the Philadelphia Museum, into an apparatus for producing electrical currents. This magnet, it is well known, will permanently support a weight of about 134 pounds.* The length of the copper wire covered with silk, which surrounds the keeper, or armature, is 400 feet. It was expected that by thus increasing the size and magnetic power of the apparatus, that corresponding electrical effects would be produced, but except in two or three experiments, they

* *Description of the Magnet in the Philadelphia Museum.*—It consists of fifteen bars, weighing fifty-three pounds, which required, on the first trial, 310 pounds weight to overcome the attractive force. Its permanent power is 134 pounds, and it now supports a weight of eighty-four pounds.
October, 1825. F. Peale.

were nearly the same as those exhibited by a much smaller instrument in my possession.

The following experiments, made with the large apparatus in the Philadelphia Museum, will no doubt be interesting to those who are curious on this subject; they were made in conjunction with Mr. Titian R. Peale, to whose kindness and skill they are chiefly to be ascribed.

The Spark.—The appearance of the spark, when the keeper revolves in mercury, is very much like the spark produced by the rotation of copper wheels in that liquid, when under the influence of an ordinary electro-magnetic current; it is perhaps brighter, and when reflected from white surfaces, strikingly resembles the corruscations of the aurora borealis. When reflected from pale blue or pale green surfaces, its colour is not at all changed. In my small machine, which is very active, the spark only appears at the moment the *cross bar* leaves the mercury, but in the large apparatus it is seen both at the *wheel* and at the cross bar.

Fusion of Metals.—When the communication between the cross bar and the wheel is made by other metals besides quicksilver, small portions of the metals appear to be fused. In order to produce these effects, a thin flat piece of the metal, about an inch broad, and rounded at the ends, must be bent in the form of an arc, and applied to the cross bar and the wheel as they revolve; the little basin of mercury being previously removed. When a strip of *lead* is used, small bluish spots of light are produced. *Zinc* occasioned a spark very much like that from the lead. When a *copper* arc was used, the light was coloured, but whether it was green, as we expected, could not be satisfactorily determined. The light from *silver* differed but little from that produced by zinc. A strip of *artificial silver* (copper and nickel) had the same effect. A piece of *tin*, or tinned iron, gave out pencils of a beautiful variegated light. With a piece of *steel*, the experiment was striking in a high degree; flashes, corruscations, and sparks, were thrown off brilliantly in every direction, not unlike the combustion of a steel wire in oxygen gas.

It is a little remarkable, that broad flat surfaces must be used in these experiments, for when blunt points form the connexions there is scarcely any light whatever produced.

Effect on Inflammable Bodies.—A jet of hydrogen gas was thrown for some time on the spark produced when the cross bar left the mercury, when that liquid was used to form the communication, but it could not be ignited. Strong ether, which is so easily inflamed by a small electrical spark, was then poured on the surface of the mercury, in the little basin, and a spark was thus made to pass through it, but no combustion ensued. The power of the instrument was, however, very much impaired, as long as the ether remained on the surface of the mercury.

Decomposition of Water, &c.—All our attempts to decompose water have entirely failed. We used an instrument similar to the one described by Mr. Saxton, at page 156, but not a bubble of gas could be observed. Besides pure water we used several saline solutions,

which are better electrical conductors, but with the same results. We expected to revive the metal on one of the platinum wires when a solution of the acetate of lead filled the tubes, but we were disappointed. Supposing that points did not discharge the *fluid* as well as surfaces, we introduced into the decomposing tube strips of silver, but without effect. Perfect contact between the wires from the tube and the wheel and cross bar, was particularly attended to, besides other means resorted to, a septum, or division was made at the suggestion of Mr. Lukens, in the little basin which contained the mercury, so that the wheel revolved in one half of the mercury, and the cross bar in the other, without communicating with each other—the amalgamated wires from the tube being also in different parts of the basin; but still no visible effect was produced on the liquids in the tube.

The Shock.—When two wires are pointed at the ends, and one end of each applied to the upper and under surface of the tongue, the opposite extremities being in contact with the cross bar and wheel, a very feeble shock is felt; but when the arrangement was made in the manner described by Mr. Saxton, at page 156, a powerful shock was experienced, passing through the tongue from one plate to the other. If, while the insulated plates in the above experiments are applied to the tongue, the upper lip be made to touch the upper plate, the muscles of the upper part of the face will then be slightly convulsed—the usual shock being at the same time produced. If one of the plates, or disks, be applied to the tongue, when the other disk is inserted between the upper jaw and the cheek, a convulsive motion will then be produced in the muscles of the mouth, accompanied by an acid taste, and at the same time a flash of light, as in the common experiment with the zinc and silver plates. From these experiments it is highly probable, that this instrument may be advantageously used, in certain cases of disease, instead of the common electrical apparatus.

Effect on the Galvanometer and Electrometer.—With my small machine, made by Mr. Lukens on the plan described at page 155, the needle of the electro magnetic multiplier was made to place itself at right angles to the magnetic meridian, and by a little management a rapid rotation of the needle was produced. With the common electrometer no divergency of the leaves could be effected either with the small or the large apparatus. We were so confident of success in this experiment that it was not until all conceivable devices for the purpose had been resorted to in vain, that we gave it up as hopeless. Thus two strips of gold leaf were attached, one to each plate of the apparatus for producing shocks; then a single piece of gold, enclosed in a glass case with a solid strip of silver; these with several other arrangements, were all ineffectual.

Effects by Induction.—We succeeded in rendering a curved bar of soft iron magnetic, by wrapping, in the usual way, a copper wire, covered with silk, many times round it, and these connecting the extremities of the wire with the cross bar and wheel. The curved bar then acted as a horse-shoe magnet, attracting by its inductive force,

light ferruginous substances. The quantity of iron lifted was by no means as great as was expected. The power of magnetic induction in an electro-magnet is supposed to be in proportion to the *heat* produced in the wire: if that be true, it may account for its feeble manifestation in the above experiment. When a helix of copper wire, through which the electrical current was made to circulate, surrounded a straight bar of soft iron, the helix not being in contact with the bar, no induced magnetism could be detected.

In the ordinary construction of Mr. Saxton's magnetic machine, the mercury in the little basin forms the communication between the cross bar and the wheel. In my small apparatus, I removed the mercury, and endeavoured to form the connection between the bar and the wheel, by filling the basin with a number of saline solutions, but no effects were produced. The only advantageous change in the original form of the instrument, which we would suggest, is when exhibiting the *sparks*, to remove the basin of mercury, and to supply its place by an arc of steel, a circular piece of copper being then substituted for the cross bar. The details, in arranging this little contrivance, are so obvious as to need no further description.

We are fully satisfied, that the maximum power of the large machine in the Philadelphia Museum, has not been developed by its present arrangement. It is proposed, therefore, to alter its form, in some respects, when further experimens will be made upon it.

Description of a New Form of the Stomach Pump. By P. B. Goddard, *M. D., of Philadelphia.*

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

This pump consists of two parts, one of which I shall call the valve box, the other is an ordinary syringe, of good construction, to which the valve box is screwed when in use.

The valve box is a cylinder of metal, containing ovoidal or egg-shaped cavities, equally distant from the centre of the cylinder; at this point a pipe enters, which, when screwed on to the syringe, opens a communication between its cavity and these two cavities in the valve box. Near each end of the cylinder, a short and slightly conical tube projects laterally, to which a flexible tube is to be fastened, and which causes a communication between the flexible tube and the cavity in the valve box. Each of these cavities contain a bullet accurately turned, so as to fit the orifices of the tubes, entering into it, and acting as a valve. It will be seen by reference to the accompanying cut (which is a section of the valve box) that if the valve box be held vertically, and the syringe screwed on to it, the bullet in the upper cavity will fall upon the orifice of communication between it and the body of the syringe, whilst the bullet in the lower cavity, will in like manner lie upon the orifice of the tube leading externally. If the lower tube be now immersed in water, and the piston of the syringe be drawn out, it will be evident that the body of the syringe will be

filled with water from the lower tube. If now the piston be pressed home, the water will pass out of the upper tube; the bullet in the lower cavity preventing its escape there, just as the bullet in the upper one prevented the entrance of air before. It will then always pump water, or any other fluid, from the lower tube to the upper.

If the position of the valve box be now reversed, and the end which was above be placed below, the bullets will fall by their own gravity into the opposite ends of the cavities, and the instrument will act as it did before, viz. pumping from the lower orifice to the upper, although the relative position of the tubes has been reversed.

To use this instrument, the valve box must be held in nearly a vertical direction. A long flexible tube being passed into the stomach, is attached to one of the short conical tubes, say the upper, and a short tube leading to a basin is then fastened to the lower one. The basin being filled with warm water, and the syringe put in action, the water will pass into the stomach and dilute the poison. When enough has passed in, the syringe is to be turned in the hand, so as to bring the tube down which was before above, without taking off the flexible tubes, or changing them in any way, and the syringe again put into action. The water will be pumped out of the stomach bringing the poison along with it.

The following are the chief advantages of this instrument. It is perfectly simple in its construction, and not liable to get out of order.

The directions for its use are easily understood, and as easily remembered.

After the flexible tubes are once adjusted, no alteration is required until the operation is finished.

When the instrument is once put in action, gallons of water may in a few minutes be passed through the stomach, thus washing away every trace of poison, and saving many a valuable life.

Explanation of the cuts.

Fig. 1.

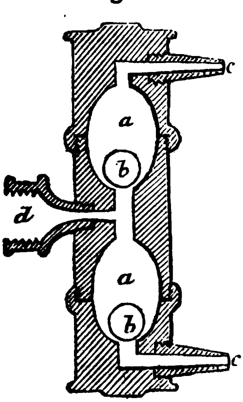


Fig. 1, section of valve box.
a a, cavities for the bullets.
b b, bullet valves.
c c, tubes, to which are attached the flexible pipes.
d, female screw to attach it to the syringe.

Fig. 2.

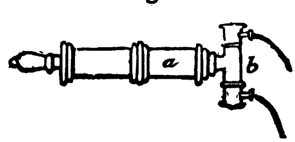


Fig. 2, the entire instrument.
a, the syringe.
b, the valve box.

FRANKLIN INSTITUTE.

Annual Meeting.

The annual meeting of the Institute was held at their Hall, on Thursday evening, January 16th, 1834.

Mr. C. C. Haven, was appointed chairman.

The chairman of the Board of Managers presented the Annual report, which was read and ordered to be published.

The resolutions recommended by the Board, establishing the committee on Science and the Arts, were adopted.

The tellers reported the result of the annual election for officers and managers for the ensuing year, from which it appeared that the following gentlemen were duly elected, viz:

James Ronaldson, President.

Isaiah Lukens, } Vice Presidents.
Thomas Fletcher, }

William S. Perot, Recording Secretary.

Isaac Hays, M. D. Corresponding Secretary.

Frederick Fraley, Treasurer.

Managers.

Samuel V. Merrick	J. Henry Bulkley
Abraham Miller	Alexander Ferguson
William H. Keating	Joshua G. Harker
Isaac B. Garrigues	John Agnew
Rufus Tyler	John Wiegand
John Struthers	William B. Reed
Matthias W. Baldwin	George Fox
Mordecai D. Lewis	Alexander M'Clurg
Charles H. White	* Robert Lindsay
Thomas Scattergood	* Joseph S. Walter jr.
Benjamin Reeves	* John A. C. Trautwine
Alex. Dallas Bache	* Samuel Hufty

* New members.

(Extract from the minutes.)

C. C. Haven, Chairman.

William S. Perot, Recording Secretary.

Monthly Meeting.

A Monthly Meeting of the Institute, for conversation, was held at the Hall of the Institute February 27th, 1834, when Mr. R. Cornelius showed a model of a lamp with a constant level in the surface of the oil. The light was beautifully clear and continued undiminished at the close of the evening. The principles of the lamp were ex-

plained. It is expected that a drawing and description will be furnished for publication in this Journal.

A large revolving keeper magnet, on Saxton's plan, belonging to Mr. T. R. Peale, was exhibited; the spark was shown by it, and also the scintellations from surfaces of steel and of copper. Critical remarks were made on the experiments, and on the construction of the apparatus.

Mr. S. C. Walker showed a pocket chronograph, by Fatton. The principle of this instrument is the same as of that exhibited at a former meeting, and noticed on the minutes. The watch form renders it more portable.

Messrs Bache and Tyler, from the committee on explosions, showed, in a modified form, the experiment of Perkins in relation to the inability of water to pass through small openings in a highly heated metallic vessel.

A fine suite of casts, in plaster, of medals, &c. was placed upon the table. The specimens were the work of an Italian artist, J. Berzanti, now residing in this city. They excited much attention, being deemed the best specimen of the art yet executed in our country.

Minutes of the Board of Managers.

At a Meeting of the Board of Managers, held January 18,

Mr. Alexander Ferguson, was elected Chairman of the Board, and

Messrs. M. W. Baldwin and Frederick Fraley, Curators for the ensuing year.

And at a meeting of the Board held January 25th, the chairman nominated the standing committees agreeably to the bye-laws. On motion, Mr. Alexander Ferguson was added to the committee on premiums and exhibitions, and to the managers of the sinking fund; and Mr. Jacob Pierce to the committee on the cabinet of minerals; when the committees were appointed as follows:—

On the Library.

Mordecai D. Lewis	William S. Perot
Isaac Hays, M. D.	George Fox
William B. Reed	Robert Lindsay

On the Cabinet of Models.

John Agnew	John Wiegand
Benjamin Reeves	Charles H. White
John Struthers	Joseph S. Walter, jr.

On the Cabinet of Minerals.

Isaiah Lukens	John A. C. Trautwine
Abraham Miller	Samuel Hufty
William H. Keating	Jacob Pierce
Thomas Scattergood	

On Publications.

Alex. Dallas Bache
Isaac Hays, M. D.
Samuel V. Merrick
Matthias W. Baldwin
Rufus Tyler

On Premiums and Exhibitions.

Samuel V. Merrick
Joshua G. Harker
William H. Keating
Isaiah Lukens
J. Henry Bulkley
Isaac B. Garrigues
Alexander M'Clurg
Alexander Ferguson

On Instruction.

Frederick Fraley
M. W. Baldwin
Rufus Tyler
Charles H. White
John Wiegand
John A. C. Trautwine

On Monthly Meetings.

Alex. Dallas Bache
Samuel V. Merrick
Isaac Hays, M. D.
Rufus Tyler
Benjamin Reeves

Managers of the Sinking Fund.

Samuel V. Merrick
Frederick Fraley
Alexander Ferguson

Auditors.

Isaac B. Garrigues
Joshua G. Harker

(Extract from the minutes.)

ALEXANDER FERGUSON, Chairman.

WILLIAM HAMILTON, Actuary.

Annual Report of the Board of Managers.

To the Franklin Institute of the State of Pennsylvania, for the Promotion of the Mechanic Arts, the Board of Managers respectfully submit their tenth Annual Report:—

The condition of the institution, which it is made, by the constitution, the duty of the Managers at this time to report to the members of the Institute, is one well deserving mutual congratulation. From a small beginning, in an attempt to diffuse useful knowledge, to promote practical science and the mechanic arts, the institution has grown to be respected by her members and the public, and to feel that her efforts have been crowned with a success, which stimulates to new exertion.

The growing taste for science, fostered by the lectures of the Institute, manifests itself in the most unequivocal manner, by the num-

bers of the class which throng the lecture room, the accommodations of which it has been necessary to extend by every device which the capacity of the room will permit. To the lecturers who have, by the accumulated labours of past years and of the present one, brought about such a result, the thanks of the Institute are due, and are given as freely as the instruction has been communicated. The course of chemistry, by Professor J. K. Mitchell, which gave such general satisfaction during the last year, has had new and appropriate interest infused into it during the present. The division of the courses of natural philosophy from that on mechanics, has permitted the lecturer, Professor W. R. Johnson, to present to the class new matter for consideration, of a popular as well as of a practical kind. To Gouverneur Emerson, M. D., who has for the second time come forward with a course on meteorology, and to J. Millington, Esq. late Professor of Natural Philosophy in the Royal Institution of London, who is engaged in a most able series of lectures to the class on astronomy, the Managers thus publicly tender their thanks. By the aid of these gentlemen the class is provided regularly with three lectures during each week.

With a view to the promotion of an interesting branch of science, geology, the Board of Managers have granted the use of their lecture room to Henry D. Rogers, Esq., late Professor of Chemistry in Dickinson College, for the purpose of delivering a course of lectures on that subject. To these lectures members of the Institute are admitted on a very favourable footing.

The arrangements made in the other branches of instruction should secure for them the warm support of the members of the Institute. The committee on instruction have placed the drawing school under the charge of Mr. William Mason, whose abilities as a teacher in that branch are extensively known. The accommodations of the school, were last year increased, by allotting to it the front room on the third floor of the hall, and an excellent and efficient discipline combined with thorough instruction, render it in every respect deserving the patronage of the mechanic. The English school under the charge of Mr. Seth Smith is no less efficient, and it is believed by the Board that strict inquiry into the items of expenditure will satisfy the members that the tuition fee fixed in this school is in reality not higher than a much less nominal sum might prove when added to incidental expenses, which are here not liable to be charged.

As subsidiary to the instructions of the lecture room should be noticed those opportunities afforded for the acquirement of information, by the library and reading room, and for mutual instruction, by the monthly meetings for conversation on mechanical and general science. During the year, the committee on the library have added to the limited number of works now in our possession whenever the funds at their disposal would permit. Donations have been received from many public spirited individuals among our members, in the foremost rank of whom by the number of their donations ought to be stated the names of the enterprising publishers Messrs. Carey, Lea & Blanchard. The donations received with the names of the doners

attached, have been regularly placed upon the shelves by the committee, whose duties have been further pursued by the preparation of a catalogue of the library, which is now nearly completed.

The monthly meetings for conversation have proved highly acceptable to the members; the absence of form, and the considerable variety introduced in them, have led to a regular increase in the attendance upon them: their organization requires only to be a little better understood to enable each one present to attend in succession to every one of the objects which may be, in the course of discussion, submitted for examination.

As contributing to sustain the spirit of scientific inquiry, the Journal of the Franklin Institute should be noticed in connexion with the foregoing subjects. Published in monthly numbers, furnished at a reasonable price, and in both matter and manner worthy of the institution from which it emanates, this Journal is winning its way into extended notice. Every member of the Institute, whose means are in any way adequate to it, should be a subscriber, recollecting that an increased subscription will enable its conductors to add to its efficiency, and will relieve the institution from any charge concerning it. The volumes for the past year have contained 872 pages, of which 495 pages have been of original matter. The labours of the editor may well be classed, as they have just been, with original matter, including as they do the reasoned abstract of manuscript descriptions, with remarks which the experience of Dr. Jones renders particularly valuable. Sixty-eight periodicals, foreign and domestic, and newspapers, received in exchange for the Journal, are placed at the disposal of the committee in the library for the reading room by the committee on publications.

Of the contributions to practical science, the experiments on water wheels, first undertaken, have been laid before the public, but the report is yet incomplete. The investigations on the explosion of steam boilers, will soon be submitted to the Treasury Department of the United States, under the direction of which the experiments have been made, and to the public through our Journal. The public mind has been, by a course of melancholy accidents, but too well prepared for the reception of a report on this subject. The branch of this inquiry relating to the strength of iron and copper, has been nearly brought to a close. It has already been reported to the Institute, that at the last session of the Legislature of our state, the Secretary of the Commonwealth was instructed by the House of Representatives to refer to the Managers of the Franklin Institute a bill relating to weights and measures, and to admeasurement. The committee appointed to consider this subject, have obtained from their members an abstract of the proceedings in England and France, and of the reports upon the same subject in our own country; these documents, as furnishing valuable matter for the understanding of the subject, will be at once submitted through the pages of the Journal. The committee have reported in part to the managers, and have stated that their labours will require but a few weeks to bring them to a close.

Among the acquisitions made during the year, the collections in natural history, belonging to the Maclurean Lyceum, have already been noticed. The minerals of this collection are in the hands of the committee on minerals, who have been engaged in arranging them. The other property will be exchanged for articles more immediately within the scope of this institution.

The model room on the third floor of the Hall, has been put in complete order by the committee on models. The Managers again call the attention of the members to the propriety of making this room a depository for specimens of mechanical skill, the ground work of a museum of practical science.

The success of the exhibition of domestic manufactures held in October last, has been alluded to in the last quarterly report. Since that time, the detailed report of the committee on premiums and exhibitions, has been received, and published in our journal. The premiums and certificates of honorary mention awarded to successful competitors at the exhibition, were publicly presented by the President of the Institute in the Society's Hall. Domestic occurrences led to the disappointment of the Managers and of the Institute in the delivery of the public address which was expected from the Hon. Daniel Webster, of Massachusetts. The number of premiums awarded at the last exhibition was thirty-three, and of certificates of honorary mention forty-eight; a reference to the list will show that the committee have been true to their trust in excluding from their awards the influence of local or sectional feeling. The premium for an improved lamp for lighting our streets, which the committee were enabled to offer through the liberality of the councils, has not yet been awarded. The duties of the committee on inventions have rather increased during the past year, and they deserve the thanks of the Board for the regularity with which they have discharged them. They have had before them thirty-four inventions, either for advice, for decision upon them, or for report. One branch of their duties is yet incomplete, namely, the reference to them of the decision as to the successful competitor for the premium for stopping the sparks which issue from the chimnies of locomotive engines, where wood is used for fuel. The committee have examined the different models which have been submitted to them, and have selected for trial those which they have deemed most likely to be successful; they have further applied to the Philadelphia and Germantown Rail-road Company for permission to make the necessary trials upon their road. In order to remove any source of complaint in relation to their selection of machines for trial, they have informed all the inventors who have offered models for examination, that they will, if furnished with the machine at the expense of the inventors, make trial of it.

Fully convinced of the benefits which have already accrued to the community from the labours of this Institute, in disseminating information and a spirit of inquiry among the mechanics, your Board have sought means by which such usefulness may be increased.

Hitherto, with some exceptions well known to you, the labours of the Institute have been directed principally to the instruction of its

members, while the community has not in turn been benefitted by the members to the extent which the amount of talent and information possessed by them would warrant the public in expecting. This defect may be attributed rather to want of opportunity than to want of inclination. By our present organization all labours calculated to increase the usefulness of the institution, are devolved upon its managers, and a few others who have shown zeal in its behalf, while the mass of its members retire from labour, probably because they have not been made to feel how useful their exertions may be to the public and to themselves.

An experience of ten years has fully tested the wisdom of the organization of the Institute; and as far as regards its fiscal concerns and its economy as a body politic; the organization could not, probably, be improved. Your Board are of opinion that such is not the case with the arrangement for the scientific labours of the institution, which can only be benefitted by the co-operation of those whom education, business in life, and habits, render peculiarly qualified for the task. Your Board, in conformity with these views, would ask your consideration of the resolutions that accompany this report; the object of which is, to unite the efforts of those members who may be able and willing to take charge of the scientific duties of the Institute.

They propose for this purpose, to create a committee to be called the Committee on Science and the Arts. This committee to be composed of all members who will voluntarily enrol their names and engage to give their services. This enrolment being merely intended as a pledge that the members of the committee stand ready, when called upon to render such services as the Institute may require, and which they may be competent to render. The services required will be to take part in committees upon subjects connected with physical science, to examine new machines or other inventions, to discuss such subjects as may be deemed of interest, in the pages of the Journal, and in general such labours as may tend to the dissemination of information connected with science and the arts.

It is believed that there are many of our younger fellow members, who having been during years past in attendance upon the lectures and schools of the Institute, are now ready to repay with interest from their acquired stock of knowledge, the benefits which they may have received. These members will, by the plan now submitted, be made known to the society, and the benefits of their exertions gained to the institution.

The Board conclude their report by an exhibit of the number of members of the Institute, and of the finances.

On the first of January, 1833, there were attached to the institution 1422 members; during the year there have been added 290 members, and fifty-three have resigned, or are deceased. The present number is 1659, of whom 137 are life members.

During the present quarter, Messrs. Geo. Jones, Jas. Magee, W. H. Ellis, and Isaac B. Garrigues, have become life members.

The treasurer's report, herewith submitted, shows a balance in his hands of $1049 56.

ALEX. DALLAS BACHE, *Chairman.*

WM. HAMILTON, *Actuary*

Resolutions recommended by the Board and adopted by the Institute.

Resolved, That the Board do recommend to the Institute, at their annual meeting, the passage of the following resolutions—

I. Resolved, That the committee on inventions, heretofore appointed by the Board of Managers, shall be extended under the title of the "Committee on Science and the Arts," and that the number composing said committee shall hereafter be unlimited.

II. Resolved, That the "Committee on Science and the Arts," shall consist of such members of the Institute as shall voluntarily enrol their names as members thereof, in a book to be prepared for the purpose, and who will, by enroling their names, pledge themselves to perform such duties, to be hereinafter described, as may devolve upon them, and to sustain by their labours the scientific character of the Institute.

1. It shall be the duty of that committee to hold periodical meetings at the Hall of the Institute, at such times as they may deem expedient, to enact rules for their own regulation, and to appoint a member to preside over their deliberations.

2. It shall be the duty of said committee to examine either as a body, or by sub-committees, all inventions that may be submitted, and to make detailed, descriptive reports thereon, giving their opinion with candour and impartiality on the inventions submitted, in the manner now practised by the committee of inventions.

3. It shall be the duty of that committee, to conduct by sub-committee, or otherwise, such scientific investigations as may be deemed worthy of consideration, and to publish the results in the Journal of the Institute.

4. It shall be the duty of that committee, by sub-committee or otherwise, to inquire and report into the state of the arts generally, or into the state of any branch thereof, when called upon to do so, in order to disseminate useful practical information, or historical facts in relation thereto.

5. To that committee shall be confided, in general, the scientific duties which devolve upon the institution, tending to mutual instruction, and to the dissemination of knowledge, and which are not specially intrusted by the constitution to the officers of the Institute.

III. Resolved, That the said committee shall be governed in the expenditure of money by the same rules as govern all other standing committees, and it shall not be competent to them to contract any debts, until they shall have been authorized by an appropriation made by the Board of Managers, upon the requisition of the committee.

IV. Resolved, That it shall be the duty of the chairman of the "Committee on Science and the Arts," to report the proceedings of the committee to the Board of Managers, at least three weeks previous

to each quarterly meeting of the Institute, in order that the information therein contained, may be included in the quarterly report; and to report to the Institute whenever directed so to do.

V. Resolved, That the chairman of the committee shall be elected annually, at the first meeting after the annual meeting of the Institute.

REPORT OF THE COMMITTEE ON WEIGHTS AND MEASURES.

Appendix to the Report of the Committee of the Franklin Institute on Weights and Measures.

Abstract of the reports on Weights and Measures which have been submitted to the Congress of the United States, or to the Legislature of Pennsylvania. By A. D. Bache, *Professor of Natural Philosophy and Chemistry in the University of Pennsylvania.*

To the Committee of the Franklin Institute on Weights and Measures.

Gentlemen,—

The portion of duty which you have assigned to me is to give an outline of the different reports on weights and measures made in our country since the period of our national independence. You are aware that this subject has occupied the attention of Congress at different times; that in some of the states the legislatures have been but little less earnest in seeking for information; and that in one, at least, the legislature has been prompt in acting upon it when obtained.

Our national councils have had the advantage of reports from two of our most eminent statesmen, the one in the earlier periods of our national existence, before the systems of weights and measures adopted by England and France had been fairly ushered into being, the other at a later period, when the full operation of the emphatically modern system adopted by France had been tested by experience. Congress have further had before them one of the best practical examinations of the subject which modern science has produced. A sister state has, under the guidance of an eminent citizen, arranged a system remarkable for its simplicity, and resting upon a scientific basis, which should insure its permanence.

The reports in relation to weights and measures in our country which I have been able to examine, are

I. A Report by Thomas Jefferson, Secretary of State, to the Congress of the United States, dated July 4, 1790.

II. The Report of a Committee of Congress, dated January 25th, 1819.

III. The Report of John Q. Adams, Secretary of State, to the Congress of the United States, dated February 22, 1821.

IV. A Report of the Secretary of the Treasury, Louis M'Lane, to the Senate of the United States, inclosing the reports of F. R. Hassler, Esq. to the Treasury Department. 1833.

V. The Report of a Committee of the Senate of Pennsylvania, Mr. Dorsey, Chairman, made in March, 1808.

VI. The Report of a Committee of the same body, Condie Raguet, Esq. Chairman, made in March, 1822.

VII. A Report by Professor James Renwick, of Columbia College, New York, to the commissioners for revising the laws of the state of New York, 1826.

I.—1. The period at which the report of Mr. Jefferson was written, was that just preceding the organization of their new system, by the French republic, and just subsequent to the proposition for reform in the existing usages, made by the Bishop of Autun to the national assembly. Mr. Jefferson sketches two systems of weights and measures, the one conforming as nearly as possible to the existing state of things, aiming only at introducing greater uniformity, the other a decimal system, retaining, however, certain names of common use, whenever the new weight or measure approximates in value to the old. The common natural basis of each system was the standard of length derived from the pendulum, but in a particular way; the pendulum proposed was a cylindric rod, and the whole length of the rod taken, instead of the length of the equivalent simple pendulum. It is unnecessary at this time to discuss the reasons why the advantages which this eminent philosopher supposed would be realized by such an arrangement, would not have existed in practice, since the system at last connects itself with, and may be considered as based upon, the length of the pendulum. The second, or decimal system, was suggested on the event of its being supposed that the people of the United States should be willing to adopt in their weights and measures, as they had done in their coin, an entirely new division. The adjustments of the first system, which Mr. Jefferson obviously views as most practicable, were as follows:—

2. The pendulum, in latitude 45°, at the level of the sea, and at some standard temperature and pressure, to be the basis of the system, and the unit of length (the foot) to bear a certain determinate ratio to this length; the determination to be made upon existing *English* standards.

3. The unit of capacity to be derived from that of length, by cubing; but one set of measures of capacity for both liquid and dry substances to be used, the unit (the gallon) to contain 270 standard cubic inches, at the rate of 12 inches to the standard linear foot.

4. The unit of weight, the ounce, to be derived from that of capacity by the weight of water which a cubic foot will contain; this being declared to weigh 1000 standard ounces, at some determined temperature and pressure. But one set of weights to be allowed, and that a sort of compromise between the troy and avoirdupois tables, founded on the fact that the avoirdupois subdivisions of the ounce, and the troy multiples of the ounce, are not in common and extended use. The tables of weights and measures proposed, are as follows:—

MEASURES.

Linear Measure, based upon the foot obtained as before stated.

10 lines	=	1 inch.	
12 inches	=	1 foot.	*Standard.*
3 feet	=	1 yard.	
3 ft. 9 ins.	=	1 ell.	
6 feet	=	1 fathom.	
5½ yards	=	1 pole or perch.	
40 perches	=	1 furlong.	
8 furlongs	=	1 mile.	
3 miles	=	1 league.	

Superficial Measure.

40 sq. perches	=	1 rood.
4 roods	=	1 acre.

Measures of Capacity, based upon the gallon of 270 cubic inches.

4 gills	=	1 pint.	
2 pints	=	1 quart.	
2 quarts	=	1 pottle.	
2 pottles	=	1 gallon.	*Stand'd.*
2 gallons	=	1 peck.	
8 gallons	=	1 bushel or firkin.	
2 bushels	=	1 rundlet, kilderkin, or strike.	
2 kilderkins	=	1 barrel. or comb.	
2 barrels	=	1 hogshead, or quarter.	
1½ hogshead	=	1 tierce.	
2 hogsheads	=	1 pipe, butt, or puncheon.	
2 pipes	=	1 ton.	

WEIGHTS.

Standard, the ounce. 1000 oz. being the weight of a cubic foot of rain water.

24 grains	=	1 pennyweight.	
18 pennyweights	=	1 ounce.	*Standard.*
16 ounces	=	1 pound.	

The pound contains 6912 grs.

5. This report was followed by that of a committee of the Senate, in 1793, to which I have not been able to obtain access.

II.—6. The next reference to this question, in our national councils, was a report by a committee, bearing date January 25th, 1819. The committee express their decided opinion, that, in the circumstances of our country, the best course is to adopt absolute standards conforming to the weights and measures in common use. They propose, therefore, that there should be obtained by a commissioner to be appointed for the purpose, models of the yard, the bushel, the wine gallon, and the pound, supposed to conform to those in most common use in the United States. Measures are then proposed for the preservation of the standards, and for the distribution of copies throughout the several states. The committee further recommend, that to provide against the loss of these standards, the yard be compared in length with the seconds pendulum, and with an arc of a terrestrial meridian; that the relation in weight of the pound to the weight of a determined bulk of pure water be ascertained, and that the bushel and gallon be defined by the weight of water which they will con-

tain. There is a vagueness in the propositions, resulting from the fact that much is left to the commission to determine, and the proposed legislation would have been of a provisional character.

III.—7. The report of the then Secretary of State, John Q. Adams, was drawn up in 1821, in conformity to a resolution of the Senate of the United States, adopted in March, 1817; by this resolution the Secretary of State was requested to prepare and report to the Senate "a statement relative to the regulations and standards for weights and measures in the several states, and relative to proceedings in foreign countries, for establishing uniformity in weights and measures, together with such propositions relative thereto, as may be proper to be adopted in the United States." The resolution embraces three distinct objects of inquiry. First. The regulations in relation to the same object in the several states. Second. The proceedings in foreign countries for establishing uniformity of weights and measures. Third. Propositions relating to the same point in the United States.

The course pursued by Mr. Adams in his general investigations is bold and ingenious, pursued more in the manner, and with the views, of a legislator, a statesman, and a lawyer, than of a mere man of science. Of this learned document, forming, as it does, a standard work of considerable bulk, it would be impossible to give an adequate idea by a simple analysis, but the parts bearing especially on the question before us, admit of a ready statement. He undertakes to show that identity of measures of length, of capacity, and of weights, for different articles, is not the natural system, and to trace the connexion of them with each other, and with the weight of coin, from the Hebrews and Egyptians, to the Greeks and Romans and, with modifications, through the complex, varying, and entangled system of the older English to the present standards. His investigations throw great light on the diversity of the English standards, and although the entire subject must claim notice from another source, and the errors in British legislation be presented to you from the same quarter, I have thought it best to exhibit, in the tabular form into which the results are thrown by Mr. Adams, the standards of measure as at different times arranged, with a view to the more proper understanding of the usages which prevail in the several states. [Note A.]

8. Mr. Adams next gives a sketch of the system of metrology (1793 to 1812) adopted by the French, in which not only the history of the system, but the various operations necessary to its completion are stated, the parts taken by the great men who figured in the work, are traced, and the difficulties of its introduction reasoned upon and illustrated; he indicates the attempt to evade the weight of popular prejudice, which impeded the system, by the restoration of old names for new things, and describes the ultimately legalized binary divisions which completed the overthrow of the decimal system. The warning thus conveyed, is accompanied by a statement that the old measures are not yet eradicated. This clear report is concluded by a comparison of the French and English systems, upon one point of which, as it

must claim particular notice from this committee, I must beg leave to offer a few remarks. [See note B.]

9. The conclusion to which this comparative, and, for the most part, practical, examination leads, is that "the time has not arrived at which so great and hazardous an experiment can be recommended, as that of discarding all our established existing weights and measures, to adopt and legalize those of France in their stead." And the opinion is based on the following reasons. "First that no change whatever of the system could be adopted, without losing the greatest of all the elements of uniformity, that referring to the persons using the same system. This uniformity we now possess, in common with the whole British nation; the nation with which, of all the nations of the earth, we have the most of that intercourse which requires the constant use of weights and measures. No change is believed possible other than that of the whole system, the benefit of which would compensate for the loss of this uniformity."

"Secondly, that the system, as it exists, has a uniformity of proportion very convenient and useful, which any alteration of it would disturb, and perhaps destroy; the proportion between the avoirdupois and troy weights, and that between the avoirdupois weight and the foot measure; one cubic foot containing of spring water exactly one thousand ounces avoirdupois, and one pound avoirdupois consisting of exactly seven thousand grains troy."

"Thirdly, that the experience of France has proved, that binary, ternary, duodecimal, and sexagesimal divisions, are as necessary to the practical use of weights and measures, as the decimal divisions are convenient for calculations resulting from them, and that no plan for introducing the latter can dispense with the continual use of the former."

"Fourthly, that the only *material* improvement, of which the present system is believed to be susceptible, would be the restoration of identity between weight and silver coin; a change, the advantages of which would be very great, but which could not be effected without a corresponding and almost total change in our coinage and monies of account; a change the more exceptionable, as our monetary system is itself a new, and has hitherto been a successful institution."

This is not the time for examining these positions particularly, but they should be before the committee as the strong grounds upon which the argument rests.

10. Mr. Adams urges upon Congress to communicate through the president with foreign governments, to introduce a union in a system of metrology, so as to produce a real uniformity throughout the principal nations of the world.

He next proceeds to a rapid view of the state of the standards in the mother country, immediately previous to the colonization of America, and then gives an outline of the enactments of the colonies, and states of our Union. This information, derived from authentic sources, the communications of the executive of the several states, will serve to give the committee a knowledge of the state of legislation up to the

time of Mr. Adams' report. I therefore append an abstract as far as relates to our present object. (Note C.)

11. The report under consideration is concluded by a review of the powers of Congress in relation to weights and measures, in which Mr. Adams obviously doubts their right to change* existing systems, and by a brief statement of the different modes of proceeding which are possible, and a recommendation of the last for present use, viz. "To adhere without any innovation whatever, to our existing weights and measures, merely fixing the standard."

To carry this object into effect, he considers that the act of Congress should embrace the following objects:

"1st. To *declare* what are the weights and measures to which the laws of the United States refer, as the legal weights and measures of the Union.

2. To procure positive standards of brass, copper, or such other material as may be deemed advisable, of the yard, bushel, wine and beer gallons, troy and avoirdupois weight; to be deposited in such public office at the seat of government as may be thought most suitable.

3. To furnish the executive authorities of every state and territory with exact duplicates of the national standards deposited at the seat of government.

4. To require, under suitable penal sanctions, that the weights and measures used at all the custom houses, and land surveys, and post offices, and, generally, by all officers under the authority of the United States, in the execution of their laws, should be conformable to the national standards.

5. To declare it penal to make or to use, with intent to defraud, any other weights and measures than such as shall be conformable to the standards."

The system which would thus be sanctioned would require the following provisions.

"For the purposes of the law it will be sufficient to declare that the English foot, being one-third part of the standard yard of 1601, in the exchequer of Great Britain, is the standard unit of the measures of the United States; that an inch is a twelfth part of this foot, that thirty-two cubic feet of spring water,† at the temperature of 56 degrees Fahrenheit's thermometer, constitute the ton weight, of 2000 pounds avoirdupois; that the gross hundred of avoirdupois weight consists of 112 pounds, the half of 56, and the quarter hundred of 28 pounds, the eighth of a hundred 14, and the sixteenth of a hundred of seven pounds; that the troy pound consists of 5760 grains, 7000 of which grains are of equal weight with the avoirdupois pound; that the bushel is a vessel of capacity of 2150.42 cubic inch-

* "The authority of Congress to act is comprised in one line of the constitution, being the fifth paragraph of the eighth section, and first article, in the following words, '*to fix the standard of weights and measures.*'"

† It is unnecessary to point out why *spring* water could not afford a basis for the relation between weight and measure.

es, the wine gallon a measure of 231, and the ale gallon a measure of 282 cubic inches.

The various modes of division of these measures and weights, the ell measure, and the application of the foot to itinerary, superficial, and solid measure, producing the perch, rod, furlong, mile, acre, and cord of wood, may be left to the established usage, or specifically declared, as may be judged most expedient. The essential parts of the whole system are, the foot measure, spring water, the avoirdupois pound, and the troy grain."

The preservation of the original standards, and the multiplication of copies of them is provided for, as well as the method of enforcing the laws requiring their use.

Mr. Adams further proposes a comparison of the standard of length with the French metre, thus giving its relation to the quadrant of a meridian of the earth's surface, and discards the pendulum, as "since the definitive determination of the metre, useless with reference to any system of weight and measure." It ought not to be forgotten that the pendulum was the means fixed upon by the French philosophers themselves, for the recovery of the metre should the standard ever be lost or impaired, and this while the recollection of their labours and difficulties, in measuring the arc of the meridian, was fresh in their minds.

I conclude the imperfect outline just given by the summary statement of the specific recommendations made to Congress.

"1. To fix the standard, with the partial uniformity of which it is susceptible, for the present, excluding all innovation.

2. To consult with foreign nations, for the future and ultimate establishment of universal and permanent uniformity."

IV. 12. The report of Mr. Adams seems to have shared the fate of those which preceded it, so far as arousing Congress to exertion was concerned, and the subject slept until the reaction of the irregularities in the different states was felt at the treasury of the United States. During the administration of the treasury department, by a citizen of this commonwealth, S. D. Ingham, Esq., an investigation was, in pursuance of a resolve of the Senate of the United States, begun under his direction by Mr. Hassler, into the relative values of the standards of weights and measures used at the different custom houses of the United States. The standards, where any such existed, were transmitted to Washington, and it soon appeared that they were of so irregular a character, and so unworthy of confidence, that the comparison of them, indefatigably pursued by Mr. Hassler, was a task entirely beneath his attention.*

At the same time Mr. Hassler availed himself of his opportunities to examine and compare different reputed standards of weight, and therefrom has resulted the most valuable collection of results that has

* The measure which proved to be nearest to the standard, was a *folding* yard stick from Philadelphia, the length of which is stated at 36.0002465 standard inches!

ever yet appeared; valuable from the number of the comparisons made, from the variety of standards, national as well as private, compared, and from the well known accuracy of the observer.* The scientific discussions of the questions relating to weighing are of the highest authority, and the determination of the curves representing the expansion of water in different vessels, for temperatures above and below its point of maximum density, of practical importance, as well as highly interesting in a scientific point of view.

13. With these points the committee are not at present directly concerned, and indeed the general conclusions might seem not to bear upon the subject of inquiry, were it not that the proposed adoption of standards of measure in the custom houses of the United States, would lead either to the adoption of the same in the localities within their influence, or to conflicting measures inconvenient to both buyers and sellers, and tending to increase instead of to diminish the present confusion. In a state where standards are already fixed by law, and cannot be changed but by a law of the state, or by the adoption of a system by Congress, when the law provides for a change, and where custom houses exist, the introduction of standards, differing from the state standards, must produce great inconvenience. It becomes the committee, therefore, to examine the provision of this report to the treasury department. They are as follows:

Standard of length;—A scale of 82 inches in length by Troughton, the divisions being copied from the same scale from which the scales used by Sir G. Shuckburg Evelyn, and Capt. Kater, had been obtained, and proved to be nearly identical with the English standard. This scale was obtained by Mr. Hassler for the coast survey in 1813. Standard temperature 62 degrees Fahrenheit.†

Standards of weight;—The avoirdupois pound to be deduced by the ratio of 7000 grs. to be 5760, from the troy pound in possession of the United States Mint, at Philadelphia, and prepared by Bate, in 1824. under the direction of Capt. Kater, of the British navy. The standard of liquid measure, the wine gallon of 231 standard cubic inches; and of dry measure the Winchester bushel, of 2150.42 cubic inches, the first containing at the point of maximum density of water, and 30 inches of the barometer 8.338888220lbs. avoirdupois, and the last 77. 627413lbs. avoirdupois.

V.—14. A resolution for inquiry in relation to a system of weights and measures for our state, produced an elaborate report from Mr. John S. Dorsey, chairman of the committee on the subject, to our state senate, in the year 1808.

Mr. Dorsey gives a lamentable account of the condition of the so styled standards of the city of Philadelphia, which, independently of the

* For comparison with part of his observations, Mr. Hassler availed himself of measurements made by a distinguished French astronomer, M. Nicollet, then at Washington on a scientific tour through our country. It is needless to say that the results were entirely satisfactory, testing the accuracy of the observers.

† In inches of this scale, one of the New York state county standard yards, the only state standard which I can find was compared, was 36.01545 inches.

doubtfulness of their claims to exactitude when originally introduced, had lost by use, all pretension to be considered as standards. On the subject of the system in common use, Mr. Dorsey speaks thus:

"The having of various units or sources for weights or measures, is a just cause of complaint; inasmuch as that, thereby, constant opportunities for wrong are afforded, which in their operation generally affect a class of society, who are least able to sustain the injury. These happen most frequently in articles of the first necessity, and the practice is predicated on a supposed want of knowledge of the various kinds of weights and measures, combined with their more various usages."

After enumerating the various frauds to which such a looseness of system may give rise, the committee gave it as their opinion, "that there should be but one unit standard, or source, for measures of extension; one unit standard, or source, for measures of capacity; and one unit standard, or source, for weight; one office for regulation for each county; one mode of measurement by measures of capacity, *to wit:* strike; and one mode of weighing, *to wit*: nett hundred."

15. A good examination of the history of British weight and measure follows, and a brief allusion to the French system, in which the committee endeavour to point out why it may not be generally, or universally adopted. The report concludes by offering an act, the provisions of which are marked with considerable boldness.

1st, The unit of length to be the English standard foot. The subdivisions to be decimal; but the multiples irregular. The superficial measures to be derived from the foregoing linear measures.

2nd, The measures of capacity to be derived from that of length by cubing, with the peculiarity that the cubic foot is the highest acknowledged measure, of which, though the regular divisions are decimal, binary divisions are allowed.

The cord of wood and of bark are defined to be 128 cubic feet, well stowed and piled.

The load of earth, &c. is fixed at 1 cubic yard, or 27 cubic feet, that of stone, at 16½ cubic feet, and of charcoal at 100 cubic feet. No heaping is to be allowed.

3d, The standard of weight is to be derived from the weight of a cubic foot of water, at 60°F. at 1000 avoirdupois ounces, ten ounces forming the *unit* of weight.

The materials of the standards, the precise manner of arranging them, and of their preservation, is described, and a peculiar nomenclature attached to the system; into this I have not thought necessary to enter. As this report is accompanied by the only detailed act since 1700 and previous to 1833, the committee may choose to have it reprinted for their use, together with the act of 1700, its supplement of 1705, and the act of 1813.*

* These documents have been collected for the Library of the Am. Philos. Society, by the indefatigable attention of the librarian, John Vaughan, Esq.

VI.—16. In January, 1822, a committee, of which Condie Raguet, Esq., was chairman, made in the State Senate, a brief report on this subject. The speedy action of our national councils being at that time expected, the committee recommended, simply, provisional measures and requested their discharge.

The subject of weights and measures in our state legislature, up to the date of this report, is closed by a reference of the bill now before the committee, to the managers of the Franklin Institute.

An abstract of the provisions of the present bill will be found in note (D) appended to this abstract.

VII.—17. The report of Professor Renwick, upon which the present system of weights and measures of the state of New York, is founded, contains so lucid, and yet so brief a statement of the scientific data concerned in the arrangement of a system, that it ought to be entire before the committee.

Considering an entire change of system to be inexpedient, if not impossible, Professor Renwick confines his views to the proper methods for fixing existing denominations and standards, and for their verification, or recovery, when lost. The results consist in the recommendation, 1st, That there shall be one standard for length and surface, one for weight, and one for measures of capacity. 2nd, That the standard of linear measure be the yard used in the State at the time of the declaration of independence; and that to insure the recovery of the standard if lost, or its verification if required, the ratio of the length of this yard to the pendulum with a brass rod vibrating seconds, in vacuo, at the temperature of melting ice, at the level of the sea, and in some given latitude and place, be declared. 3d, That the standard of weight be derived from that of length, by the weight of a cubic foot of water, being declared to be in vacuo, at its maximum density, and weighed with brass weights, 62½ pounds: the ounce being the sixteenth part of such a pound. 4th, That the unit of measures of capacity, dry and liquid, be the gallon, to contain at the mean pressure of the atmosphere and level of the sea, ten pounds of distilled water, at its maximum density. All other measures of capacity, to be deduced from this by continued multiplication or division, by the number two.

These recommendations were substantially adopted in framing the law, but the introduction of a liquid gallon to contain 8lbs. of water at its maximum density, destroyed the uniformity contemplated in the liquid and dry measures.

NOTE A.

Table showing the proportions of the measures of capacity of England, at different periods.

(Taken from a corresponding table in Mr. Adams' report. p. 142.)

Date of Statute.	Wine gallon.		Corn and Beer gall.		Bushel.		Remarks.
	Statute Standard.	Existing Standard.	Statute Standard.	Existing Standard.	Statute Standard.	Existing Standard.	
	Cubic Inches.		Cubic Inches.		Cubic Inches.		
1225							[1] Exchequer bushel of 1091.
a						2124.[1]	[2] do. of Henry VII.
						2124.[2]	* Rumford gall. of 1228. [3] do. Eliz. 1601.
1266	217.6	217.6	266.3	266.25*	2130.4	2128.9[3]	
1353							
a						2145.6	Winchester bushel at exchequer.
1439	219.45	217.6	268.53	266.25	2148.24	2150.42	do. by statute Wm. III.
1496	224.	224.†	224.	None.	1792.	None.	† Guildhall gallon in 1688.
				280.‡		2224.	Excheq. bushel Henry VII. ‡ Exchequer qt. of 1601.
"	"	"	280.	278.4[a]	2240.	2217.62	Coal bushel of Anne. *a* Exchequer pt. of 1601—2.
				272.[b]			*b* Excheq. gall. Hen. VII.
				271.[c]			*c* Gall. 1601, marked EE.
"	"	"	272.	270.4[d]	2176.	None.	*d* " " E.
" 1531 1705	231.		282.	282.[e]	2256.	None.	*e* Treasury ale gallon.

NOTE B.

The point in question may be thus stated; that the natural system of metrology requires two sets of measures; one for liquid and the other for dry substances, and two sets of weights; or, in the language of Mr. Adams, "the result of these reflections is, that the uniformity of nature for ascertaining the quantities of all substances, both by gravity, and by occupied space, is a uniformity of proportion, and not of identity; that, instead of one weight and one measure, it requires two units of each, *proportioned* to each other; and that the original English system of metrology, possessing two such weights, and two such measures, is better adapted to the only uniformity applicable to the subject recognized by nature, than the new French system, which, possessing only one weight and one measure of capacity, identifies weight and measure only for the single article of distilled water; the English uniformity being relative to the *things* weighed and measured, and the French only to the instrument used for weight and mensuration."

The arguments which are advanced are,

1. "The relative value of all the articles which are bought and sold by measures of capacity, is a complicated estimate of their specific gravity and of the space which they occupy. If both these properties are ascertained by one instrument for any one article, it cannot be applied with the same effect to another. Thus the litre, in the French system, is a measure for all grains and liquids: but its capacity gives a weight only for distilled water. As a measure of corn, of wine, or of oil, it gives the space they occupy, but not their weight. Now as the weight of those articles is quite as important in the estimate of their quantities, as the space which they fill, a system which has two standard units for measures of capacity, but of which each measure gives the same weight of the respective articles, is quite as uniform as that which of any given article, requires two instruments to show its quantity; one to measure the space it fills, and another for its weight."

Is it correct to say that the relative values of all articles depend upon a compound of their bulk and density, or in other words, upon their mass? Is not the estimate of value to be fixed as well upon a given bulk as upon a given weight? Do we compare the relative values of wines, or even of the different kinds of spirits, by their specific gravities? And if these views were correct, would they not justify a separate measure for every article sold, for tea, coffee, sugar, and milk, as well as for wheat, wine, or oil? Does it matter in the present state of society, whether corn and wine were once the first necessaries of life, and produced separate natural standards, defined by the relative gravities of corn and wine?

2. "This diversity is, therefore, founded in the nature of things; and may be stated in the following rule: that whatever is sold by weight in *measures* must have a measure for itself, which will serve for no other article, of different specific gravity; and as wheat and wine are both articles of that description, as their specific gravities are very materially different, although they are very suitable to be weighed by the same weight, they yet require different measures, to place them in equipoise with that weight."

The objections which I have just urged seem to apply, in force, to the argument now stated, which Mr. Adams has thus happily answered. "Our country is not a land of vineyards. We have no flowery dales of Sibma, clad with vines. Wine is an article of importation; an article of luxury, in a great measure confined to the consumption of the rich. Its distribution in measure, and the exactness of the measure by which it is distributed, is not an incident which every day comes home to the interests and necessities of every individual. We have less reason for regretting, therefore, the loss of a measure which would prove its integrity by its weight; and more reason for preferring the uniformity of singleness in the French system of capacious measures, to the uniformity of proportion which belonged, originally, to the English. That proportion itself we have lost by the establishment of a wine measure of 231, and a corn bushel of

2150 cubic inches: and although it exists in the troy and avoirdupois weights, and in the wine and beer gallons, it exists to none of the useful purposes for which it was originally intended, and to which, in former days, it was turned".

"The consumption of wine in modern times is exceedingly diminished, not only by the substitution of beer, and of spirits distilled from grain in the countries where the vine is not cultivated, but by the use, now become universal, of decoctions from aromatic herbs and berries. Tea and coffee are potations unknown to the European world until within these two centuries: and they have probably diminished by one half the consumption of wine throughout the world."

3. "The measures by which solid and liquid substances are sold are not, and cannot conveniently be, the same."

The reasons given I submit to the committee.

I. Because the form and nature of the vessels in which they are and must be kept, are different in the two classes of substances.

II. Dry substances are most conveniently measured, liquids weighed.(?)

III. The purchase and sale of dry and liquid substances, is not at the same times or places, nor by the same persons.(?)

IV. "There are conveniences in the intercourse of society, connected with the use of smaller and more minutely perfect weights and measures of capacity, for sales of articles by retail, than by wholesale, and for articles of great price though of small bulk."

V. "There is, finally, an important advantage in the establishment of two units of weights and measures of capacity, by the possession in each of a standard for the verification of the other."

NOTE C.

Legal provisions for Weights and Measures in the several states up to 1821. (*Extracted from the report of J. Q. Adams, Secretary of State.*)

Massachusetts.

1647. Measures to be provided from the mother country. No troy weights named.

1692. Declares weights to have been derived from the exchequer of England, and the measures to be Winchester measures.

1705. Troy weights to be procured for silver, bullion, &c.

1730. New set of avoirdupois weights, introduced from the exchequer, and measures Winchester measures. In use to this day.

1800. Standards confirmed by state law.

1804. Troy weights stated to be too light, and a specific number of grains directed to be added to each one.

New Hampshire and Vermont.

1718 a 1797. Weights of Exchequer of England, and Winchester measures. No troy weights by law.

Rhode Island.

No law. Standards derived from Massachusetts.

Connecticut.

1800. Bushel to contain 1099 cubic inches, (probably a copy of that of 1670 of England.) Ale gallon 282 cubic inches. Wine gallon 224 do.; changed

1801. in 1801 to 231 cubic inches. No troy weights by law.

New York.

1703. Weights and measures according to English exchequer.

1784. Measures recited to have been procured from exchequer made standards.

1809. A yard measure procured in 1803 from England exchequer, declared the standard of the state.
1813. Declares standards in use, at the declaration of independence, according to the weights and measures in the Secretary of State's office, to be the standards until Congress shall provide others.
1826. See abstract of Professor Renwick's report.

NEW JERSEY.

1725. Adopts the measures of weights of England.

PENNSYLVANIA.

1700. Standards to be obtained from the exchequer, provisional standards adopted. Beer to be sold retail by *beer* measure, and English assize of casks, so that it was paid for by wine, and sold by beer measure, repeal-
1705. ed in 1705.
1813.
1833. See sketch of proposed act.

DELAWARE.

1705. Standards to be obtained from the exchequer of England.

MARYLAND.

1641. Winchester bushel adopted for two years, and still used.
1671. English standards to be procured and distributed.
1692. Law of 1671 confirmed. No beer measure.
1715 and 1765.
1781. Troy weights recognized.
1805. Mayor and City Councils of Baltimore authorized to fix the standards for that city.

VIRGINIA.

1623–4, Weights and measures not to be used unless sealed.
1631–2. A barrel of corn to contain five Winchester bushels.
1646. Weights and measures of statute 12, Henry VII, (1496,) declared the
& only legal weights and measures. Copies to be provided by sealers.
1661. So that the legal weights were not the ones really used, the latter being the exchequer standards.
1734. Provisions of 1661 confirmed omitting reference to act of 1496.
1792. Act of 1734 to continue in force until congress enact laws for regulating weights and measures.
1818. Assize of staves regulated.

NORTH CAROLINA.

Prior to revolution. Act adopting exchequer standards, and providing for the distribution of copies, and preservation of standards.

SOUTH CAROLINA.

1768. *London* standards adopted.
1785. Justices of county courts authorized to regulate weights and measures within their several jurisdictions.

GEORGIA.

1803. Standards of Savannah and Augusta declared to be those of the state.
Ordinance of city councils of Augusta prescribes *avoirdupois* weights, *wine* measure for liquids, and *Winchester* bushel for dry substances.

KENTUCKY.

1798. States that congress not having legislated, they adopt the Virginia standards of 1734.
Governor to procure standards. The bushel declared to contain 2150 2-3

solid inches, and the wine gallon 231. Copies to be made, and standards preserved by Secretary of state.

TENNESSEE.

No standards fixed.

OHIO.

1811. A half bushel of 1075 2-10ths. solid inches to be made and kept as the standard.

LOUISIANA.

French measures originally used.
1814. Standards directed to be procured to conform to those used by the United States revenue officers. Copies to be distributed, &c.
A barrel ordained to contain 3¼ American bushels.

INDIANA.

1807. Standards of English measure to be procured and distributed, and avoirdupois weights. Half bushel to contain 1075 1-5th cubic inches, a gallon 231 do. To remain in force until congress otherwise provide.
1818. Confirmed.

MISSISSIPPI.

1807. United States, or, in their absence, English avoirdupois weights and standard measures of length, and dry measures of capacity, and *wine* measures liquid. Copies to be distributed.
1815. Directions for distribution of weights and measures.
1818. Further directions for preserving standards. Confirms the standards until congress shall fix a standard.

ILLINOIS.

1819. Standards to be procured of English measure.
A wine gallon to contain 231 cubic inches. Half bushel to contain 1075.2 cubic inches. Pound avoirdupois to contain 7,020 grains troy.

ALABAMA.

1807 and 1815. Of Mississippi territory apply.

MISSOURI.

1813. Linear measure adopted, English.
Half bushel to contain 1075 1-5th cubic inches. Gallon 231 cubic inches.
Avoirdupois weight.

DISTRICT OF COLUMBIA.

1802. Provides for keeping of standards fixed (?) by congress, by corporation, and the sizes of weights and measures used in the city, by the same. Corporation have conformed to statutes of Maryland.

NOTE D.

Chief provisions of the bill of 1833 *for regulating Weights and Measures in Pennsylvania.*

Provides for procuring and preserving standards. For conforming to those of the United States when fixed.

Linear standard to be the yard. Customary multiples and parts allowed.

Superficial measure. Acre defined to be 4840 sq. yds.

Capacity measures. Wine gallon 231 cubic inches.
Beer do. 282 do.
Bushel 2150.42 cubic inches.

Lime bushel 13½ ins. diam. at bottom. } 13.47 inches deep.
15 „ top.

A cord of wood to contain 128 cubic feet.

A hogshead of cider 110 wine gallons.

Weights.—Troy pound to be equal to that of the United States mint, and the avoirdupois pound to bear to it the ratio of 7000 to 5760.

Miscellaneous.

Provides for distributing the county standards, and for verifying them, fines, penalties, &c.

60	pounds avoirdupois of wheat to pass for a bushel.	
58	„	rye.
„	„	corn.
48	„	buckwheat.
47	„	barley
32	„	oats.
85	„	coarse salt (foreign.)
70	„	ground salt.
62	„	fine.
80	„	anthracite coal, 112 lbs. to make one cwt. and 2240 lbs. = 1 ton.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN SEPTEMBER, 1833.

With Remarks and Exemplifications, by the Editor.

[Continued from p. 182.]

28. For an improved *Cotton Carding Engine;* William B. Leonard, Fishkill, Dutchess county, New York, September 16.

After describing the carding engine with much minuteness, the claim is made in the following words, which is all we can afford to give. "Now, all the aforesaid parts of the foregoing described machine, such as breast, main cylinder, workers, strippers, flat, doffers, comb, &c. are well known and in common use, and to their invention I make no claim whatever; but what I do claim as new is the arrangement and location of these several parts, in the manner before described; so that a much greater proportion of the surface of the main cylinder is brought into action with the other parts.

"I am aware that this object has been, heretofore, in a measure, obtained by raising the main cylinder above the plates of the frame; in which case it was necessary to have the feed apron and table high enough to feed the card conveniently, and the doffer high enough to deliver the cotton to a can. But since I have introduced my spreading machine, I can with greater convenience, feed the card lower down," "and the depressing or placing the doffer below the centre of the main cylinder, and bringing so great a proportion of that cylinder into action with the carding parts, without raising the cylinder itself, constitutes my improvement of this engine."

29. For an improved *Rail-way Drawing Head,* for drawing cotton; William B. Leonard, Fishkill, Dutchess county, New York, September 16.

The specification of this patent is of great length, minutely describing the whole arrangement of the machinery. The object of the invention is to equalize the drawing of the bats from any number of carding engines. We can do no more than give a very general idea of the manner in which this is proposed to be accomplished. Suppose four carding engines to be placed in a line with each other, and to operate together; the drawing head stands opposite to the space between the two centre machines, and the battings from the doffers descend into troughs, or rail-ways, formed of tin, there being two such troughs extending from each end towards the centre; the bats from two machines are received in each, and carried by endless belts towards the centre, being slightly condensed in their passage by the pressure of friction rollers. At the middle, they are conducted, and pass together, through the drawing head, so as eventually to form a single sliver, which falls into a can. Should one of the carding machines stop, from any cause, provision is made to alter the stretch of the drawing heads, by disengaging machinery, so as to diminish it one-fourth, in consequence of which there will be no alteration whatever, in the size of the sliver, and no general stoppage of the machinery.

"To the invention of this rail-way, or any of its appendages, or to any part of this machinery and drawing head, which has been heretofore used, I make no claim whatever. But what I do specifically claim as my invention and improvement is all that combination and arrangement of machinery before described, by which the amount, or quantity, of stretch, or draw, of the head, is diminished or increased at pleasure, not only as effected by placing the larger increasing cog wheel on the gear end of the back roller of the front drawing head, and the smaller, or diminishing, cog wheel on the pulley end; but the order may be reversed, and the effect will be the same when properly clutched.

"And I claim this improvement, not only as applicable to this front drawing head, but also to the back head, or both heads, and to all drawing heads on which it may be useful; and not only as effected by placing the increasing and diminishing cog wheels on the back roller, but on either roller, as most convenient; and not only in the proportion described above as suitable for four cards, with which I use it, but also as proportioned to any number of cards which can be worked with it, or any difference of draw, or stretch, that may be desired.

"And I also claim the application of the belt, which serves as a carrier for the sliver between the front drawing and delivering rollers."

We think the two specifications of the foregoing machinery unnecessarily prolix and complex, but at the same time the things claimed appear to be set forth with sufficient distinctness.

30. For a *Horse Power*, for propelling machinery; Philo C. Curtis, and Linus Yale, Utica, Oneida county, New York, September 17.

In this *horse power*, there are to be four wheels, and four pinions, so calculated as to give twenty-seven revolutions to one. The horse is to be geared to a lever in the usual way, and the wheel work is to be beneath him. The last driving wheel and its pinion are to be bevil geared.

The patentees "specifically claim, principally, the making the frame and wheels of cast iron, and arranging the parts in such a manner as to occupy but a small space, and at the same time reduce the friction of the different parts by a corresponding motion of the wheels. In a business where less speed is required, the last mentioned spur wheel and pinion may be left out."

Iron wheels and frames have been so often used, if not *specifically claimed*, that a person, some time since, who took a patent for a horse power, claimed the making them in part of wood and in part of iron. The above claim to the making them altogether of cast iron, is, however, as well founded as that to the manner of arranging the parts, in which there is not the slightest shade of novelty, as it consists in the mere gearing of wheels and pinions in the ordinary way.

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31. For a *Thrashing Machine;* James Hart, and Waller S. Holladay, Spottsylvania, Virginia, September 17.

This patent is taken for the manner of constructing the cylinder and concave, which is as follows. A square bar of iron is to form the shaft of the cylinder; the gudgeons, of course, being rounded. Flat bars of iron, from sixteen inches to two feet in length, are to have square holes made through their centres, so that they will slip on to the shaft. One of them is to be put on, and against it a circular piece of plank, four inches less in diameter than the length of the bar, leaving the latter to project two inches, to form teeth, or beaters; the plank, by its thickness, regulating the distance of the teeth. A second bar is to be placed against this plank, at right angles to the former, then another plank and another bar, until there are enough for the length of the cylinder. For the sake of greater firmness the bars are let into the plank; and to keep the whole together, four screw bolts are to pass from end to end of the cylinder, through the plank and bars The concave is to be placed above the cylinder, and to be formed of plank, with projecting teeth, on the same principle.

There is no claim made, but as the whole description consists in the manner of constructing the cylinder and concave, the object of the patent is sufficiently apparent.

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32. For a *Seaman's Mattrass, or Bed;* Israel Martin, Boston, Massachusetts, September 17.

The claim in this patent is "to the using of cork shavings as a material for filling the mattrass; and to the partitions for preventing them from shifting."

A mattrass is to be made, either of common ticking, or of water proof cloth, and this is to be filled with thin shavings of cork. The mattrass is to be divided into separate compartments, by strips of cloth, in order to prevent the removal of the cork from one part of it to another. This mattrass, it is said, will be soft and yielding, not liable to become matted like hair, or dusty like moss, whilst it will serve as a life preserver.

A short time since, a patent was obtained for filling mattrasses with rasped cork, but we believe experience has shown that when so filled they are without the requisite elasticity, and that although they would be buoyant, yet when once wet they would remain so for a great length of time; other objections, it is said, were experienced when it was attempted to bring them into use. The present patentee, although he has not made the water proof covering an essential part of his mattrass, has found, experimentally, that this is a point of high importance, both as regards buoyancy and elasticity, and we believe that he now manufactures them all in this way.

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33. For a *Thrashing Machine;* Linus Yale, of Otsego, and Philo C. Curtis, of Utica, Oneida county, New York, September 17.

The concave is to be a semicircular trough of cast iron, supported on suitable legs, and having rows of teeth projecting from its interior. The cylinder is to be made by bending round, and brazing, or riveting, sheet iron of one-eighth of an inch in thickness. This is to be set with teeth of iron, or steel, and to have wooden or iron heads to receive a shaft, which revolves in boxes at the ends of the semicircular concave.

The claim is to the "cast iron frame, the sheet iron cylinder, and the form of the spikes, or cogs, and manner of fastening them into the cylinder.

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34. For an improvement in the *Metallic Slides and Cases for Ever-pointed Pencils;* James Bogardus, city of New York, September 17.

The improvement here patented consists in so arranging the parts of an ever pointed pencil case, that the point which holds the pencil shall be obtruded and detracted without having a slot in the side, with a ferule and pin to draw it down, as is ordinarily done. The exterior case consists of a continuous cylindrical tube, without projections or openings. To cause the point which holds the pencil to protrude, the head of the pencil case is made to revolve; this acts upon an interior tube by means of a quick threaded screw, which should, in preference, be made left handed. The chamber for spare pencils, and the holding point, remain as heretofore. A competent workman will readily conceive, without the aid of the drawings, how the respective parts should be arranged. In the specification, these are clearly set forth, and the claim is to "the application of the coarse

thread screw, either direct or back-handed, and the general arrangement of the parts as herein described."

We presume that pencil cases may be made in the way proposed at a cost but little exceeding the usual construction, and they will certainly be more neat, and less liable to admit lint and dust from the pocket.

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35. For a *Machine for Cutting Biscuit, Crackers, Pilot, and Navy Bread;* Joseph Clark, city of Philadelphia, and Henry Henderson, city of Baltimore. First issued September 13, 1830. Surrendered and reissued on an amended specification, September 18, 1833.

We noticed the specification of this patent in vol. vi. p. 302, where a general description of the machine will be found, with some remarks upon what we deemed defects in the claim. In the new specification this is substantially altered; it is in the following words—

"What we claim as new, and as of our own invention, is, 1st, the continuous motion of the rollers, which prepare the dough for cutting and moulding, and deliver it upon the surface on which it is to be cut and moulded, produced by the same power that moves the cutters, and cuts and moulds the dough, combined with cutting and moulding perpendicularly upon a flat surface, the rollers continuing in motion while the dough is being cut and moulded. 2nd. The stoppage of the surface on which the dough is cut and moulded, at the instant of cutting and moulding, in combination with the continuous motion of the rollers which prepare the dough for cutting and moulding. 3d. The elevation of the rollers above the surface on which the dough is cut and moulded, and their distance from the cutters, to permit the dusting, or brushing, of the dough with flour preparatory to its being cut and moulded, and to permit a sag, or bending downwards, of the dough, between the rollers and the surface on which the cutting or moulding takes place, and so compensating for the difference between the continuous motion of the rollers and the interrupted or irregular motion of such surface, as well as obviating any difficulty arising from the varying elasticity of dough made from different kinds of flour. 4th. The arrangement of the mechanical parts in such combination as to produce the above described effects."

"Note.—Various modes may be employed to communicate power from one part of the machinery to the other. Cog wheels might be substituted in place of a band, and the sliding board might be moved forward by a catch, working on a ratchet wheel, as the carriage of a saw mill is moved."

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36. For an improvement in *Bedsteads;* Gideon Vaughan, jr., city of Philadelphia, September 18.

This bedstead is called "the rocking and ventillating bedstead, by a fan tester." The tester is supported upon four corner posts, like those of a high post bedstead, there being a rail connecting the two

head posts, and another connecting the two foot posts near to the floor, but raised from it by means of castors.

The side and end rails of the bedstead are framed together independently of the corner posts, and this frame has rockers under it, which rest upon the rails near the floor. When the rocking motion is not required, there are hooks and screws to render the sacking frame stationary. The fan extends along under the tester, and is to be vibrated by a cord, like those along the dining tables of steam-boats. This cord is to be worked by the person in bed, or otherwise.

The claim is to "the combination of the bedstead, or crib, or rockers, with the external frame, bed posts, tester, and fan and screw, in the manner herein described, so as to unite the advantage of a stationary bed, of rocking, of ventillation, and of simplicity and economy, in one machine or invention."

In the bedstead as described and represented, there are, besides the four corner posts already noticed, two others, which are in the middle between the head and foot posts, passing up to the tester, and supporting the gudgeons of the fan. We thought of omitting the notice of these, as they look very much out of place, and appear to be about as necessary as "a fifth wheel to a coach."

This, we think, is one of those improvements which most people will be willing to do without, and we doubt, very much, whether the patentee will meet with sufficient encouragement to induce him again to favour the public with the fruits of his genius.

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37. For *Machinery for Propelling Steam-boats, and other Vessels, in lieu of Water Wheels;* John M'Curdy, of Norwich, Connecticut, but now residing in the city of London, September 18.

The apparatus which is the subject of this patent, is called "the duplex crank propellers." Paddles of any form which may be preferred, are to dip into, and to leave the water vertically; each paddle being operated on by two cranks, the shafts of which are placed horizontally, one above the other. The two cranks appertaining to each paddle must be equal in length, and when attached to the paddle handle, must stand in the same direction; they will then, in their revolution, carry the paddle so that every part of it will perform a circle equal to the sweep of the cranks. There may be several pairs of cranks, on the same shafts, each carrying its own paddle, and standing at different angles, so that some of them will always be acting on the water. The claim is "simply the arrangement and connection of the rods, or arms, to the double cranks, acting together, with the paddle attached to the lower end, by the principle of this motion forming a complete propeller."

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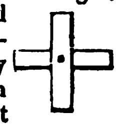
38. For a *Washing Machine;* Samuel Swett, jr., Readfield, Kennebeck county, Maine, September 18.

Although this is a washing machine, and has been preceded by hundreds of others, against which we might write ditto, ditto, it yet comes

forward with some claims to novelty, which alone gives it a title to our consideration; but besides this, if the inventor's account of it be admitted as sufficient proof of its goodness, the clothes put into it will be "thoroughly cleansed, which cleansing is effected in half the time, and with less than half the labour expended by any machine which has yet come under his observation. Its superiority consists in its simplicity; the ease with which it may be worked, even by children; the effectual manner in which the washing is completed, and the avoiding of the most disagreeable part of the labour, as washing is ordinarily conducted."

The novelty consists in the form of the revolving vessel in which the clothes are to be put. Each end of this is made by taking two boards about three feet in length, and eight or nine inches wide, and halving them together flatwise, so as to form a cross, as in the margin; these are to be placed fourteen or fifteen inches apart, and one side of each covered by nailing on a board; the opposite side is to be in part boarded, and in part formed by open slats; end pieces are also to be nailed on, each of them having thirty-five pins inserted in them, which project within the box; each of the sides of the box is to be fluted crosswise, in the manner of the common washboard. The part with slats forms doors for admitting and removing the clothes.



This box is to have gudgeons attached to the centre of each of its ends, and is so placed that it may be made to revolve in a trough, which is to contain the suds. It is then to be turned slowly, so as to allow the clothes to fall from end to end. The claim is to the general form of the machine,

Should the extent of its use be commensurate with the space we have given to it, compared with that usually allotted to washing machines, it will do well.

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39. For improvements in the *Plough;* Sarah Evans, and John M'Faden, executors of George Evans, deceased; Pittsburgh, Pennsylvania, September 18.

The improvements for which this patent is obtained were made by Mr. George Evans, and a description of them filed by him in the patent office a little time previous to his decease. They consist in such matters of form and arrangement as could not be understood without the drawings.

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40. For an improvement in the *Apparatus for Steering Vessels;* Banjamin F. Adams, Boston, Massachusetts, September 19.

We are unable to make much out of this improved mode of steering, which appears to us so similar in its results to some of the old modes, as to impress us with the opinion that its utility will not be such as to supercede those in use. The inventor calls his apparatus the "steering horizontal quadrant wheels;" but for what reason we cannot tell, as the steering quadrant is vertical. Instead of a horizontal steering wheel, a quadrant of such a wheel is employed, the

arch of which is furnished with steering handles, and has on it a groove to receive the steering rope, chain, or band. The quadrant, of course, turns upon pins at its centre. A vertical shaft, behind the quadrant, has on it three horizontal wheels, the centre one of which receives the steering rope from the quadrant, which is conducted to it by two sheaves upon the deck. This middle wheel slides up and down upon its shaft, and can be made to engage with either of the other two, which are fixed on the shaft, and from each of which ropes extend to the rudder.

The claim is to "the before described horizontal steering wheels, by which the direction of a vessel may be changed by the shifting wheels; and to the quadrant for steering the vessel."

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41. For an improvement in the *Mode of using Water Power;* John Abbott, Reading, Middlesex county, Massachusetts, September 19.

The specification of this patent is altogether defective, from its referring throughout to a *model*, by which the description is to be illustrated, instead of referring exclusively to a drawing; the latter article, however, accompanies, and might probably obviate the force of any objection which should be urged on the ground mentioned. But if this defect is not fatal, there exists another which will most assuredly prove so, and that is, the entire inferiority of the mode of obtaining the power of water, to that ordinarily employed. The scheme would be found vulnerable on the score of its want of novelty, but it is needless to urge this point, because we can most unhesitatingly pronounce the thing to be without utility, in which case its novelty is of little importance.

The invention is said to consist "in applying the weight of water, at any given height, to one or more buckets, or vessels, suspended by chains, rods, or line gears, and connected with a lever beam, or operating upon a vibrating circle."

The water is to be contained in a tight flume, beneath which there are to be two buckets, which are alternately to rise and fall. They may be suspended by rods, having teeth on them which take into ratchet wheels on a horizontal shaft, so arranged that the descent of either will cause the shaft to turn in the same direction. When one of the buckets rises to the flume, the other is at the lower part of the fall. The rising bucket is to strike a rod, or other contrivance, at the bottom of the flume, which is to open a valve, and allow it to fill with water; the lower bucket, at the same moment, having valves in the bottom of it which are to be opened, is to discharge its contents by similar means; the upper bucket is then to descend and raise the lower one, and so on alternately.

This contrivance has undoubtedly been made under the false supposition that there is a loss of power in the overshot, or breast wheel, on account of the varying distance of the water from a line vertical to the centre of the wheel, and that it acts with its full power only when the bucket containing it is in a line horizontal to the centre.

We could easily muster up as many contrivances founded upon this same erroneous notion, as of those intended to do away with the crank motion in the reciprocating engine; schemes which are perfectly comparable with each other.

The patentee is manifestly aware that it must take some time for his buckets to fill and discharge, and to obviate this difficulty he proposes to introduce a pendulum, "as in the accompanying model," the vibrations of which are to give additional force to the required motion, at the point of time when its change is effected. Ought there not to be some additional contrivance to regulate the motions of the pendulum at the moment of change?

To the instructed machinist, the error of the whole scheme, as above presented, will be obvious; but there is something still less seaworthy behind, which partakes of the very essence of perpetual motion. We are informed, for example, that the principle may be indefinitely extended, and that "water being raised to an elevation by any moving power, (equal to a horse power, for instance,) may acquire by the use of the hydrostatic lever, an increased power in proportion to its height."

We do not mean to assert that the water would act with less power in this apparatus, than on the common overshot wheel, estimating merely the effect produced by its descent from a given height, but that the objections to this mode, in the time required to fill and discharge the buckets, and from several other causes, will be found not merely formidable, but absolutely insuperable, by those who may attempt to carry it into practical operation.

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42. For an improvement in *Knobs of Glass, for Doors, Furniture, &c.;* Theodore F. Abbott, Canton, Norfolk county, Massachusetts, September 19.

The introduction of a pin of iron or steel into the mould used for for forming glass knobs, is the subject of this patent. This pin is to be about one-fourth of an inch in diameter, and is to extend from the bottom of the knob towards its centre, to the distance of five-eighths of an inch, leaving, when removed, a hole of that size; "the other end may be easily broken off when the knob is cold, and a perfect hole will then be formed."

The drawing of the mould is without written references, and the description, from this cause, is wanting in clearness; perhaps, however, it may be sufficiently clear to the adept.

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43. For a *Machine for Making Shingles;* John Bush, Dayton, Tippacanoe county, Indiana, September 19.

A crank attached to a vertical shaft, turned by a water wheel, is to communicate a horizontal, reciprocating motion to a plane which is to shave and joint the shingles; at the extreme end of the plane, a cross cut saw is to be attached, which is to saw off the logs into bats, from which the shingles are to be rived, there being a suitable carriage for sustaining the log. On one side of the block which carries

the plane iron, there is a knife for riving the shingles, and a rest upon which to sustain the but. The shingles after being rived are to be jointed by an iron for that purpose, and placed under the plane to be faced, the bed upon which they lie being an inclined plane, to give them the proper taper. The claim is to the peculiar arrangement and combination of the several parts of the machine.

The whole is described in a vague manner, so that any one who should attempt to construct a machine from the information given, must possess a good portion of inventive genius, or meet with many difficulties. We apprehend, in fact, that it has not yet been essayed by the inventor, and that he, therefore, has much to learn respecting it.

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44. For a *Cooking Stove;* Levi Kingsbury, Livonia, Livingston county, New York, September 19.

An open stove, furnished with doors, and having a pipe, or flue, above, makes a part of this apparatus; behind this there is to be a shallow box, the bottom of which is formed by a continuation of the bottom plate of the open stove; this is to have side plates, which may probably be five or six inches in width, and a top plate, furnished with holes to receive cooking utensils. The back end of this box opens into the flue of a common chimney, and the lower part of the back plate of the open stove is removed, that a portion of the heat and flame from the ordinary fire may pass through the box, and into the chimney flue. A register is provided to close this opening when required, so that the box may be used for cooking when there is no fire in the open stove. There are sliding furnaces which may in this case be applied in the lower plate of the box; and this is spoken of as being a very advantageous arrangement in warm weather. It is said, that, in many cases, the heat from the fuel in the open stove, will suffice for cooking, without the aid of the sliding furnaces. The lowness of the upper plate of the box is spoken of as greatly facilitating the management of the pots and kettles.

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45. For *Preparing Milk and Cream for Making Butter and Cheese;* Calvin Ainsworth, Littleton, Grafton county, New Hampshire, September 19.

The directions given are as follows:—For making butter, one ounce of saltpetre, an ounce of *sal cileratus*, and a pound of salt, are to be put into six quarts of milk when first taken from the cow; stirring the milk until the whole is dissolved.

The cream is to be prepared for churning as follows. Two table spoonfuls of this mixture, a tea-spoonful of acid of tartar, and "a tea-spoonful of Rochelle, or acid of salt," are to be put into a bottle with a quart of cold water, and this, after being well shaken, and standing a day or two, is to be added to such a quantity of cream as will make eight or ten pounds of butter. "In hot weather, the quantity of *sal cileratus* may be increased to two ounces."

If cheese is to be made, the milk, when first taken from the cow, is

to be prepared by putting an ounce of the first preparation into every six quarts of it, one hour after which the rennet is to be added.

How, or why, this improves the butter and cheese we are not informed, and have not discovered; we suppose, however, that the mixture is a substitute for the salt usually employed for seasoning; it is certainly somewhat empirical, and we presume that one who calls sal aeratus, *sal cileratus*, and denominates something else "Rochell, or acid of salt," cannot give us the rationale of the action of these ingredients upon each other.

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46. For a *Machine for Sweeping and removing the Dirt from Streets;* Levi Kidder, city of New York, September 20.

It was intended to publish the specification of this patent in the present number, but it is mislaid. When found it is probable that we shall present it to our readers. The machine was designed for the use of the city of New York, and it was anticipated that it would produce a great saving in the business to which it was to be applied. We have not heard the result of the trial in the large way.

A cylindrical broom was to operate by means of the wheels of the machine, which was to be drawn on like a cart. This, and the receptacle for the dirt, were securely covered, the whole being managed in a manner that manifested much ingenuity. There are many difficulties, however, in the way of the successful operation of such a machine; among these may be mentioned deep holes, and other inequalities in the pavement of a city, against which it must be nearly, if not altogether, impossible to provide; others, equally formidable, might be mentioned, and we shall be glad to see that this machine has met with and conquered them.

47, For an improved *Mode of Building Walls in deep Water;* Henry K. May, Boston, Massachusetts, September 23.

Parallel rows of piles of sufficient length to extend above the surface of the water, are to be driven down, leaving such a space between them as shall be necessary for the thickness of the wall to be built. These piles are to be sustained in their places by diagonal spur shares on their outsides, and are to be capped with strong longitudinal timbers. A platform for the workmen, and to sustain the windlasses and materials, is to rest upon these caps. A stout frame is to be formed by uniting transverse and longitudinal timbers; the transverse timbers being of a length equal to the thickness of the intended wall, and the longitudinal ones, of a length equal to such section of it as is intended to be built at one time; the whole must necessarily be thus divided into distinct sections to carry the proposed plan into effect.

In forming this frame, the transverse timbers are placed at suitable distances, parallel to each other, and the longitudinal timbers upon them; one being situated near their ends on each side, and the whole secured together by trenails, or otherwise.

This frame is to be slung under the platform upon which the windlasses are placed, by ropes, attached to blocks, and passing under

the projecting ends of the transverse timbers. When so placed, the foundation of a section of the wall is to be laid upon it. The stones, cut to a proper size, are to be laid in the manner of headers and stretchers, the first row of headers extending from one longitudinal piece to the other, immediately over the transverse timbers, and the first row of stretchers extending from one of these to the other, immediately over the longitudinal pieces; these courses are to be continued, and the frame lowered into the water, until the wall reaches low water mark. The spaces between the headers and stretchers are then to be filled in with rubble work. Section after section is thus to be built, until the whole wall is completed.

A good drawing of the machinery, and mode of construction, accompanies the specification; and the claim is to "the mode herein before described, of constructing walls and masonry in deep water, and the adaptation and arrangement of the machinery and apparatus for accomplishing the same."

LIST OF AMERICAN PATENTS WHICH ISSUED IN NOVEMBER, 1833.*

With Remarks and Exemplifications, by the Editor.

1. For an *Agricultural Steam Apparatus;* Edmund C. Bellinger, Barnwell District, South Carolina, November 19.

It has been repeatedly prophesied that the day would arrive when our farmers would plough their fields, and perform many other agricultural operations, by steam; and those wights who have supposed themselves inspired upon this subject will probably find "confirmation strong," in the title of the above named patent; it will be well, however, for them to recollect that "all signs fail in dry times," and that the weather-wise are then liable to find themselves deceived. It is one thing to take out a patent, and another to carry the thing patented into successful operation. Were we to begin to furnish exemplifications of this truth, we should not know where to stop, and shall therefore leave it to every one to supply his own proofs, which he may readily do by a moderate tax upon his recollection.

In the plan before us there are to be two carriages, placed parallel to each other on opposite sides of the field to be *ploughed, harrowed, rolled, sowed, or mowed;* one of these carriages is to be furnished with a steam engine, having two cylinders placed horizontally, by which are to be turned drums, or whirls, that carry an endless band, crossing the field, and passing round pulleys on the opposite carriage. To this band the agricultural instruments are to be attached, and when one furrow has been ploughed, the two carriages are to be advanced a few inches, and the operation repeated.

In one point of view, at least, we think this a most admirable contrivance; as it will not only furnish much business for our operatives

* For a period of two months, including a part of September, and November, there were no patents issued, in consequence of a vacancy in the office of Attorney General.

should the apparatus go into general use among the agriculturists, but it will give to the farmers the means of employing all those whom the pressure of the times have thrown out of work; as, to tend the said engines, to supply the fuel, guide the plough, and perform every other operation incident to cultivating the ground upon this improved plan, will demand three or four times as many hands as are necessary in the practice of the old mode; and not only will it require more hands, but more horses too, so that those thrown out of use by rail-roads and locomotives, will sell well to the farmer; and as one branch of trade begets another, he, in his turn, will have to raise more grain, as he will have an increased *home* demand for its consumption. This is a fertile subject, but as we have other patentees waiting our respects, we must, with these few hints, leave the prosecution of it to others.

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2. For a *Knapsack*, called the "Folio Extension Knapsack;" James Boyd, city of Boston, Massachusetts, November 19.

Two frames of wood are to be made, of the length and width to be given to the knapsack, which is to be quadrangular. These frames are to be covered with leather, or water proof canvass, in such a way as to leave a space between them sufficiently large to receive the articles they are to contain. An intermediate frame of wire serves to keep the edges of the knapsack distended, and to confine it in its place. The opening into it is made on the side next to the back, and is covered by a flap; it is furnished with the straps requisite for slinging it, and with a loose flap, or roll, on the upper side, to receive a coat or blanket.

The invention is said to consist in "a new combination of materials and forms, by which a new and useful knapsack will be formed, having the advantages of greater simplicity than those hitherto in use; of being perfectly water tight; of preserving a neat appearance, whether entirely empty, or filled to its utmost extension."

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3. For an improvement in the construction of *Canal Boats;* Sylvester Doolittle, Utica, Oneida county, New York, November 19.

This boat is not "as old as the hills," because they were made before canals were dug, or rivers navigated; it, however, belongs to the class of MODERN ANTIQUES, being merely a twin boat, formed by connecting two narrow boats by a deck crossing their wales, and leaving a space between them.

All claim to invention is, very properly, omitted.

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4. For an apparatus for *Sizing Paper;* Edmund Blake, Alstead, Cheshire county, New Hampshire, November 19.

This is an apparatus intended for sizing paper in the sheet, without handling it in the usual manner; and thereby to prevent its being torn, as well as to facilitate the operation, by sizing a much larger portion at once than can be done in the way ordinarily pursued.

A water tight chest or box, is made to hold the paper and the sizing, one end of which being so attached that it can be loosened by removing the hooks, or keys, that serve to fasten it. The bottom of the chest is ribbed, or fluted, to allow the fluid to pass readily under the paper placed in it. A piece of board, called a follower, about the size of one end of the box, has fastened to one of its edges, projecting ribs, or strips, which pass into the space between the flutes on the bottom of the chest, when the follower is placed near to one end of it. A hole in the bottom of the chest, for the purpose of letting out the liquid, is closed by a plug.

To use this apparatus, the follower is placed in the chest, near to one of its ends, which is then filled with paper over which bars are passed to keep it down; the sizing liquor is then poured in, and suffered to remain until it has penetrated the paper. The plug is then to be withdrawn, in order to allow the fluid to run off, and the chest to be tilted so as to stand on its movable end; the wedges, or hooks, being loosened, the chest is withdrawn and the follower removed, by which means the paper is left in a situation which admits of its being pressed in the common way.

The claim is to the apparatus, as described.

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5. For a *Bathing Machine;* Daniel Brumley, city of New York; an alien, who has declared his intention to become a citizen of the United States, November 19.

Whether Mr. Brumley is an original inventor, or an intentional plagiarist, we cannot tell, but this we know, that the machine for which he has obtained a patent is identical, not only in substance, but even in form, with that patented by Ehrenfied and Backmann in January, 1833, and which is described in vol. xii. p. 31, with a cut showing the plan of the apparatus; which cut has also been inserted in the newspapers for months in succession. Mr. B., we observe, made the declaration of his intention to become a citizen on the 14th of August last, seven months after the original patent was obtained.

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6. For an improved *Furnace for Burning Anthracite Coal, for Heating and Evaporating Liquids,* denominated the "Railway Furnace;" William Barrett, Malden, Middlesex county, Massachusetts, November 19.

The ends which are said to be attained by the use of the furnace here patented, are, "the lessening, to a considerable extent, the expense of fuel, and the time required to attend on the fire; a more rapid heating of the fluid by a more immediate approximation of the fire to the bottom of the containing vessel; the withdrawing and applying the fire with greater facility than by any of the methods heretofore known, and the preserving of the grate bars from the effect of the intense heat of the furnace."

"The grate, with its appendages, which is used for sustaining the fuel, is made to run upon a rail-way, by means of iron trucks, or

rollers, from which circumstance it is denominated *The Rail-way Furnace.*"

The part of the specification which follows the foregoing quotation, refers to a well executed drawing of the apparatus, the general nature of which may, however, be understood without it. The carriage, or frame, which sustains the grate bars, brings the fuel as near to the bottom of the boiler as possible, and is so enclosed that no air can enter excepting that which passes through the fuel.

The grate bars are cast with a groove, or channel, along their upper sides, which groove may be three-fourths of an inch deep; this "groove in the bars protects them from injury by the intense heat of the fuel; which it does, not only by diminishing the points of contact with it, but also by retaining ashes upon each bar, which is a bad conductor of heat."

The claim is in the following words—

"What I claim as new in the furnace herein described, is that arrangement thereof by which I am enabled to bring the burning fuel, anthracite, much nearer to the bottom of the vessel to be heated than can be effected by any of the ordinary modes of construction, namely, by making the furnace in the general form described, and running the same upon a rail-way. I do not claim as my invention the mere running of the furnace upon a rail-way, this having been before done, or proposed to be done, in fireplaces of a certain description, but I claim it only in combination with the kind of furnace which I have described. I also claim the manner of securing and directing the draft between the grate bars by means of the ledges, flanches, or fillets, on each side of, and beneath, the frame of the furnace. I likewise claim the particular construction of the grate bars, grooved on their upper sides, in the manner, and for the purpose, above set forth."

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7. For an improvement in the mode of cutting and making *Shirt Collars;* William J. Cantello, and Robert M. Kerrison, city of Philadelphia, November 19.

These collars are either to be attached to shirts, or used separately from them; and they are called the "Belvidera collars." A drawing accompanies the description, which shows the manner of cutting the various parts; and by a quotation from the specification it will appear that the aid of the natural sciences has been invoked in the formation of them.

"The band is broader than heretofore used, and tallies in breadth with the length of the neck, and is made as nearly as possible to fit and adapt itself to the shape of the human neck and adjacent parts. For this purpose, the lower edge of the band is so cut as to resemble in its outline the Bow of Cupid, curving down in the centre to cover the *Crycoid Cartilage*, and the *Thyroid Gland*, and curving upwards on each side to avoid the pressure of the *Clavicle* and the *Sterno-cleido-mastoideous Muscle.* The upper edge of the band proceeds upwards on each side from the centre, in a line corresponding with

the inclination upwards of the *lower jaw bone*, to a point under the angle thereof, and thence downwards at a nearly equal angle so as to avoid the pressure of the *Mastoid process of the Temporal Bone*. A small oval piece of a size according with the parts to be fitted, is cut out of the centre of the upper edge of the band, so as to give room for the angle of the *Thyroidal Cartilage* or *Pomum Adami*." The claim is to the principle and mode of cutting, constructing, and shaping, the upper edge of the band, and the lower edge of the ruffle, as above described, and nothing more."

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8. For a *Wiring Machine, used in the manufacturing of Wire from Tin Plate;* Edward M. Converve, Southington, Hartford county, Connecticut, November 19.

This wiring machine resembles some of those which are already in use for the same purpose, but there are modes of adjustment, and variations of structure adopted in it, which are considered as improvements, and claimed as new; they are not, however, very clearly represented in the drawing, and were they so, it would not be very easy to describe them without it. The model is referred to, which would probably render the whole plain.

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9. For a *Friction Furnace for Generating Heat;* John W Cochran, Lowell, Middlesex county, Massachusetts, November 19.

(See Specification.)

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10. For an improvement in the *Machinery for Printing;* Samuel N. Dickinson, Boston, Massachusetts, November 19.

The improvements here described are applied to the hand printing press, and the first of them is intended to remove the defect occasioned by the falling of the inking roller, as it is usually constructed, into the quadrats, or spaces, between the pages of matter; the impressions being usually rendered imperfect by its pressing more forcibly on the type at the sides than at other places, as it falls into, and rises from, these spaces. To obviate this, there are to be wheels, on the gudgeons of the inking rollers, which may be of the same diameter as the rollers themselves, and these are to bear, and run upon, ways, adapted to them. These ways are so constructed as to sink down when the tympan is brought upon the form, and to rise when it is raised; for this purpose, the tympan is furnished with a tail piece on each of its lower angles, which, when it is thrown up, act upon a system of levers, and produce the effect of raising the rails: the inking rollers are then conducted over the form with regularity.

The second improvement consists in a particular arrangement of the inking apparatus, intended to equalize, and facilitate, the distribution of the ink. This it would be difficult to describe without a drawing, and we, therefore, shall not make the attempt.

The claim is to the application of a system of levers to the bed, to be acted upon by projecting pieces on the lower angles of the tym-

pan, which raise parallel rails for the purpose described; and to the mode of applying the ink fountain for distributing and equalizing the ink.

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11. For a machine for *Sawing Felloes;* William W. Forward, Hartford county, Maryland, November 19.

This machine has a saw frame composed of two upright and two cross timbers, the former are placed near together, and the latter extend beyond them, forming arms at each end, which have saws strained between them. The two upright pieces, which might in fact be in one, are guided between fender posts, and the saw frame is worked up and down by a crank and pitman, in the usual way.

There being two saws, two felloes may be sawed at once. The carriages on which the timber is placed, work on a centre pin, the distance of which from the kerf is equal to the radius of curvature. The claim is to the combination and arrangement of the several parts; in this, however, there is very little of novelty, and we see nothing essentially different from the combination previously existing in other machines for the same purpose, of which there are several in the Patent Office.

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12. For a *Churn;* Warren Eastbrook, Salem, Montgomery county, Ohio, November 19.

This churn has received, in the specification, the more dignified name of "a machine for the manufacturing of butter." It consists of a square box, within which a dasher wheel is to be turned by means of a crank; which dasher wheel is very much like such as have been frequently used in barrel churns. The wheel, we are told, "throws the cream with velocity against the end of the chest, and falling to the bottom, consequently forms a current running against the wheel, thereby receiving a greater agitation."

There is no claim made.

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13. For a *Mortising Machine;* Joseph Dennis, and Israel A. Richardson, Palmyra, Wayne county, New York, November 19.

This mortising machine differs in its mode of action from most of those which have been made for the same purpose, but still it is not new in its essential features. There is a kind of socket chisel, the outside of which is to be rectangular, and of the length and width of the mortises. Augers are to revolve within this chisel, there being two, three, or more, depending upon the relative length and width of the mortise to be made. The augers are of the screw kind, and the sides of the chisel is perforated to deliver the chips therefrom. The chisel is to be so fixed to one end of the frame of the machine, that the augers may be made to revolve within it; the stuff to be mortised is laid upon a suitable carriage, by which it can be brought up to

and forced against the chisel. The edges of this latter are chamfered inwards, and so formed as to cut obliquely as it enters the mortise. The drawing accompanying the specification is very imperfect, scarcely sufficing to show the general construction of the machine, and in regard to its details affording no light whatever.

The claim is "the use of two or more augers and a chisel, adapted to each other, and formed or constructed on the principle of those above described, to whatever purpose the same may be applied," "whether the same be placed in a frame, and operated in the manner above mentioned, or be applied in any other way for the purpose of mortising, or be operated in any other manner."

In the second volume of the first series of this Journal, p. 240, there is a report of the committee of inventions of the Franklin Institute, dated September 4th, 1826, which relates to an instrument of a similar construction, there denominated "an auger for boring square holes." And it is stated that "where a longitudinal hole, *or mortise*, is wanted, two or more augers are placed side by side, furnished with their appropriate sockets, and retained in their places by obvious contrivances." The gentleman who presented this apparatus had a machine at work for mortising the hubs of wheels. This report was drawn up by the editor, who then believed the contrivance to be new; he has since learned, however, that it had been invented some years prior to the above date.

14, For apparatus for *Distilling;* Joseph T. Dwyer, Nashville, Davidson county, Tennessee, November 19.

This invention is said to consist in a manner of constructing what may be termed the still-head, so that it will condense the aqueous vapour, and produce spirit, or alcohol, of any required strength, more effectually and expeditiously than can be done by any mode that has been heretofore adopted.

What is here intended by the still-head, is, more properly, an intermediate condenser, placed between the still and the worm tub; the still being merely furnished with a cover, but not with what is usually denominated a head. The intermediate condenser is thus constructed. There is a cylindrical, oval, or other formed vessel, placed at each end of a rectangular box, or trough, made water tight. These two vessels are connected together by a number of small tubes, placed parallel to each other, like the bars of a gridiron. The end of this apparatus which is towards the still is raised so that the tubes may have an elevation of about thirty degrees. The containing box is to be filled with water, the temperature of which is to be regulated according to the required strength of the spirit. A tube from the top of the still leads into the upper copper vessel; and from the lower one a tube passes to the worm of the condensing tub. The aqueous vapour, which is condensed in the intermediate apparatus, is returned to the still by a tube leading back to it from the under side of the lower copper vessel.

The claim is to the general arrangement of the cylinders and pipes, but not to them in their individual capacity.

The modifications of the still have now become so numerous, that a simple description of them would fill several large volumes. There are many which are constructed with the same intention as that expressed in this specification; some of them, however, are much more complex, and if this has any special merit, it is dependent solely on its simplicity of construction; the claim, therefore, is very properly restricted to the arrangement described.

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15. For a *Corn Shelling Machine;* Frederick Elliott, Greensboro', Guilford county, North Carolina, November 19.

We derive our knowledge of the construction of this machine, almost exclusively from the drawing, the description being not only obscure, but making no mention of some of the arrangements delineated. A cylinder of wood, five inches thick, and three feet in diameter, is to be made to revolve horizontally by means of a crank turning a toothed wheel, the cogs of which take into corresponding cogs on the upper side of the cylinder. The periphery of the latter is to have iron spikes, forming projecting teeth, driven into it. Four feed hoppers, through which the corn is to be dropped, are placed at equal distances apart, over the edge of the cylinder, and a spring board beneath each of these, bears the corn against the teeth.

A fanning apparatus is to be attached, but this is of the usual construction. There is nothing in the form of a claim, although there appears to be enough of novelty in the particular arrangement of the parts upon which to found one. We doubt, however, whether this machine will be found equal to several other corn shellers, either in durability or in ease of working.

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16. For an improvement in *Spinning Cotton;* John L. Eddy, Killingley, Windham county, Connecticut, November 19.

The specification of this patent is drawn up in a very imperfect manner, and, like that above noticed, neglects altogether to distinguish what is new from that which is old. The improvement is said to be in "the building cops by self-operation on a bare spindle, called the transverse flyer." The transverse motion of the bobbins is to be given by four or more inclined planes, which move back and forth upon a carriage, and appear to operate upon the wave rail by acting upon pins which project from it, and slide upon the planes; the inclination of these gives the length of the cop.

The use of some other portions of the apparatus which are noticed in the specification, and shown in the drawing, might probably become apparent had we sufficient time to bestow on the consideration of them; but this time is a precious article, and we cannot afford to part with it without the prospect of receiving value for value.

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17. For an improvement in the *Construction of Coffer Dams;* William Easby, Washington, District of Columbia, November 19.

The coffer dam for which this patent is obtained is to be either circular, oval, or a many sided polygon. The manner of forming it does not differ in any essential particular from that commonly pursued. The patentee says, "I particularly claim the circular figure of the dam, whether a perfect circle, oval, or a polygon of many sides; dispensing with braces, and giving it greater strength."

Different forms have been given to coffer dams, suggested, of course, by the shape of the pier which is to be erected within them; we are not aware, however, that they have ever been made circular or oval; there are, in fact, but few cases in which circular coffer dams would be admissable, as it is a point of importance that the area within the dam should be no greater than is required for the laying the foundation, as, otherwise, the quantity of water to be discharged would be increased, and other evils encountered; there would, however, be a manifest advantage derived from the form, especially where the depth, and, consequently, the pressure, was great.

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18. For an improvement in the *Wheels of Rail-road Carriages;* John Elgar, Civil Engineer, city of Philadelphia, November 19.

(See specification.)

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19. For an improvement in *Moulding Crackers;* Joshua G. Driscol, Auburn, Cayuga county, New York, November 19.

This cracker machine differs entirely in its construction from all those which we have before seen, but without the drawings we can give only a very general description of it.

All that is proposed to be effected by the machinery is to roll the dough into round balls, thus preparing it to be finished by hand. The first part of the apparatus consists of a cylinder of wood, which may be sixteen inches in diameter, and three feet in length. This is made to revolve within a hollow cylinder of equal length, but larger in diameter. About one-fourth of this cylinder is removed for its whole length, and that which revolves within it is placed eccentrically, so that the space between the two may be at least as wide again on one side as it is on the other. When the inner cylinder is revolving, lumps of dough are thrown in at the wide part, and these come out in long rolls at the narrow one. They are thence conducted into a second apparatus, constructed somewhat like the former, but smaller, and fluted round, in such a way as to convert the long rolls into balls.

The claim is to the particular arrangements of the various parts of the machinery for producing the effects described.

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20. For a *Machine for Washing and Fulling;* Bohan Dewey, Milton, Trumbull county, Ohio, November 19.

A box, or trough, is made to contain the articles to be washed, or fulled, and three, four, or any convenient number of beaters or hammers, are made to vibrate within it; the vertical levers to which these hammers are attached, are hung upon pins, and worked backward and

forward by pitmen on a crank shaft. The claim is to the "applying of the lever power to the hammer." This we think a very insecure kind of claim, but should be unable, in the present instance, to suggest one which would be otherwise.

[TO BE CONTINUED.]

Specifications of American Patents.

Specification of a patent for improvements in the mode of Kiln Drying Wheat Flour. Granted to Nathan Tyson, *city of Baltimore, August* 8, 1831.

To all whom it may concern, be it known, that I, Nathan Tyson, of the city of Baltimore, in the state of Maryland, have invented certain improvements in the kiln dryer, patented by Oliver Evans, on the 22nd day of January, 1808, as specified by him among certain "inventions of improvements in the process of the art of manufacturing grain into flour or meal, and for other purposes;" by which improvements in the mode of preparing wheat flour and other kinds of meal for packing, their tendency to sour, or to become otherwise injured by keeping, if not altogether obviated, is much decreased; and that the following is a full and exact description of the same.

It is a well established fact, that the various species of fermentation which take place in vegetable matter, are not produced by temperature alone, but require the presence of a certain portion of moisture. The advantage derived from the kiln drying of grain and of meal, depends upon this principle; and my improvement consists in a more effectual and beneficial mode of accomplishing the end proposed, than any of those which have been heretofore adopted.

I take the flour, or meal, either as it leaves the mill stones, or after it has been submitted to the process of bolting, and cause it to pass through cylindrical or other suitable tubes, or boxes, to which a revolving or vibratory motion is to be given, and in which the flour, or meal, is subjected to the action of steam or of heated air. The tubes, or boxes, may be constructed either of wood or of metal, according to circumstances, and they may be suspended and moved in the manner of the common bolter. Within the cylinder, or other apparatus, containing the flour, or meal, to be dried, I generally place small ledges, which may stand perpendicular to such cylinder or other apparatus, and project to such height from its inner surface, and have such direction, either parallel with or inclined to its ends, as may appear best calculated to detain, conduct, or agitate the flour, or meal, and expose it for the requisite time to the influence of the artificial heat employed.

When heated air is used as the drying agent, the cylinder, or box, containing the flour, or meal, may be made to revolve within a long oven, or kiln, with the ends of said cylinder open to receive and deliver the flour, or meal. I sometimes, however, intend to enclose the cylinder entirely within the oven, or kiln; a tube will, in this case,

pass through the cover to admit the flour, or meal, to be dried, which will then escape through another tube at the opposite end. When so constructed, the heated air will not only surround, but be contained within, the cylinder, or box.

When steam is applied for the purpose of drying the flour, or meal, I surround the tube, or box, which in this case must be made of metal, or other good conductor, with an exterior case, or jacket, within which it revolves; a sufficient space being allowed between the two for the passage of the steam or heated air, which is to be admitted from a boiler, or stove, properly constructed, and conveniently situated for that purpose; such connecting tubes, dampers, and valves, being attached to the apparatus as may be required, according to the various modifications of which it is susceptible. The steam may be admitted through a hollow gudgeon, and allowed to escape in the same way, there being tubes to conduct it to and from the space provided for it.

Instead of the revolving cylinder, or box, I intend sometimes to construct a cylindrical, or other, chamber, with suitable floors or shelves, one above the other, upon the upper one of which the flour, or meal, may be received, whence it may pass to those below it, being stirred and carried by *hopper boys*, or other suitable contrivances. Heated air will, in this case, be admitted into the chamber, and have its exit through suitable openings. For steam, the floors, or shelves, must be made double, and the steam pass through them, in ways well known to every mechanist.

A current of air, sufficient to carry off the moisture, separated from the flour, or meal, must in all cases be admitted into the cylinder, or box, in which the flour, or meal, is contained. In most cases, no particular provision need be made for this purpose; and where this may be requisite, the means of doing it are too obvious to require description. The drawings deposited in the patent office, will serve to illustrate the process and apparatus herein described; but I do not intend to confine myself to any particular form, construction, or position, of the tube, or box, or of the other parts or modifications of the apparatus. A series of convoluted tubes may be employed, forming a structure like that of the screw of Archimedes, and, indeed, an almost infinite variety of shapes may be given to the apparatus, all operating upon the same principle, and producing the same effect, with equal, or nearly equal, advantage.

What I claim as new, and for which I ask a patent, is my improvement in the drying of flour, or meal, either bolted or unbolted, by means of the application of steam, or of heated air, in an apparatus constructed in the manner, and upon the principle herein before described.

NATHAN TYSON.

Experimental Results of Kiln Drying Wheat Flour, and other kinds of Meal, for which a patent was obtained by NATHAN TYSON, *of the city of Baltimore, August,* 1831.

In our list of patents for August 1831, vol. ix. p. 102, we inserted

the title of the above named patent, with a remark that it was intended to publish the specification when the result of some experiments, then in progress, should be ascertained. The delay in redeeming this pledge, has resulted from the urgent desire of the patentee, that public attention might not be called to his plan until he should have had an opportunity of exporting his flour to places the least favourable to the preservation of that article, and of keeping it there a sufficient length of time to give the utmost certainty to the result of these tests This has now been accomplished, and in several instances, a barrel of the flour so exported has been retained when the ship's cargo was sold, and brought back on the return voyage. The subjoined extract of a letter from the patentee, written at the request of the editor, must be perfectly satisfactory on these points. Numerous certificates might have been obtained had they been deemed necessary, but the individual most interested in procuring them was not desirous of doing so, and where he is known, at least, it is altogether unnecessary.

When the plan was first made known to the editor, he had no hesitation in declaring that it must prove perfectly successful; as, without the presence of moisture, that fermentation which produces souring cannot take place. It is not a little remarkable, that a plan so simple, and so rational, should not have been adopted long since. The kiln drying of grain is a well known process, and modes of cooling and drying the flour after it has left the stones, have been universally employed, and, indeed, every step, excepting this last and most important one, had been previously taken. We published in vol. vii. p. 102, a communication from one conversant with the subject, on the souring of American flour, and more especially of that from the western country. It was there recommended to employ a wind fan to blow cool, fresh air, among the meal as it issues from the stones, and in other parts of its manufacture, for the purpose of drying it. Now to effect this object fully, it is manifest that instead of *cool* air, that which is *warm* and dry, is the most proper agent.

It appears that from eight to twelve pounds of moisture, may be expelled from a barrel of flour, when in the state in which it is usually packed. The greater part, if not the whole, of this moisture, might undoubtedly be discharged in carefully kiln drying the grain; but the consequence of this would be that superfine flour could not be made from it, as nearly the whole of the bran would be chopped up by the stones. It is probable, too, that a much higher degree of heat would be required to separate the moisture from the grain than from the flour.

Extract of a letter, dated Baltimore 3 *mo.*, 1*st*, 1834.

"In accordance with thy request, I now inform thee that my flour drying apparatus has been in successful operation for upwards of two years, during which time I have prepared many thousand barrels of flour, which has been shipped to every quarter of the globe, and has

stood the test of all climates for from six to twelve months, ***without any deterioration whatever.*** Advices from Gibralter and the West Indies inform me that after laying eight or ten months, my flour was found to be quite as 'perfect as though just from the mill.' Within a few days past I have received the amount of the sales of a lot which I shipped in December, 1832, to Liberia, in Africa, with instructions to keep it twelve months, when it was sold, and proved to be *perfectly sound.*

"Amongst the many to whom I have sold largely of the kiln dried flour, is the very respectable house of Wm. Patterson and Sons, of this city, a copy of whose certificate is annexed. In no instance whatever have I had a complaint of the dried flour not keeping perfectly; in several instances, a few barrels have been brought back from the East Indies and the Pacific ocean, and always in as perfect a state as when first made."

CERTIFICATES.

"I do hereby certify, that I have purchased from time to time a considerable quantity of dried flour, which I shipped to the West Indies and South America—say Brazils, and round Cape Horn. That in every instance this flour kept perfectly sweet, and that I believe it would keep sweet for years in almost any climate.

(Signed,) WM. PATTERSON.

Baltimore, February 15th, 1834.

"I have visited Mr. Nathan Tyson's mills, and seen his flour drying machinery in operation, and have no hesitation in pronouncing it an important discovery, and that flour thus prepared must necessarily keep perfectly for a long time.

(Signed,) SAML. STUMP,

Baltimore, February 15, 1834. *General Inspector of Flour.*

It would be difficult to magnify the importance of an improvement in the manufacturing of flour, which effectually prevents its souring; as this is not an effect produced upon a solitary barrel or two, but not unfrequently upon whole cargoes, which become sour even during the time of short voyages to the West Indies, or the southern portion of our continent; and, indeed, large quantities arrive at New Orleans in this state, although shipped on the waters of the Ohio, immediately after it is packed in barrels. A large portion of that put up for sea stores, on all long voyages, is thus lost; and but few persons would credit the account, were we able to state the proportionate quantity of that so shipped on board our vessels of war, which is eventually thrown overboard, as totally spoiled.

Specification of a patent for improvements in the Wheels of Rail-road Carriages. Granted to John Elgar, *Civil Engineer, city of Philadelphia, November* 19, 1833.

To all whom it may concern, be it known, that I, John Elgar, Civil Engineer, of the city of Philadelphia, have invented certain improvements in the wheels of rail-road carriages, by one of which improvements they are made to adapt themselves more readily to curved roads, than such as have been heretofore used for that purpose; and by the other a construction is given to them which will render them more firm and durable than those now in general use; and I do declare that the following is a full and exact description of my said improvements.

The self-adjusting conical wheel for running upon curved roads is well known to engineers, it having been made the subject of a patent by Mr. James Wright, and a modified form of it being now used on the Baltimore and Ohio rail-road. The plan which I have devised is a new modification of this principle, by which some of the inconveniences which have hitherto attended its employment are in a great degree, if not altogether, obviated.

Instead of making the wheel conical on its whole tread, like Wright's, or of forming the conical part against the flanch, and leaving the other part cylindrical, as in those used on the Baltimore road, I form the cone on the outer part of the tread of the wheel, opposite to the flanch, leaving that part of the tread which extends from the flanch towards the opposite side, cylindrical, or nearly so, for one half of its width, more or less, and then tapering outwards in such degree as may be most convenient, according to the curvature of that part of the road which has the smallest radius.

The curved part of the road is adapted to these wheels, by widening the track in proportion to the radius of curvature, so as to admit the conical part to roll on the interior rail, whilst the cylindrical part bears upon the exterior rail. This construction obviates the objection arising from the wrong tendency of the cone when running on the exterior rail, and adapts the whole more perfectly to those parts of the road which are straight, and produces other advantages which will readily occur to experienced engineers.

In order to render rail-road wheels more firm and durable than those now in use, I form that part of the wheel usually occupied by the spokes, of two plates of iron, preferring for this purpose thick sheet iron of three-eighths of an inch, more or less, in thickness. These sheets of iron are raised so as to be concave, or dishing, forming the segments of a large sphere, or, if preferred, they may be made conical. These plates have a hole in their centres to receive the hub, or nave, and have a flanch turned up over which the hoop of the hub may pass; or, if preferred, the hub may be secured in other ways. If the rim, or tire, is of wrought iron, the plates may have a flanch turned at their peripheries, through which they may be riveted on the interior of the rim. When the rim is of cast iron, the plates may be se-

cured without a flanch, one being cast within the rim, on either side, against which the plates may fit, rivets, or bolts, passing through them, and through the flanch to secure them in their places. Other modes of fixing the plates in their places may be devised, and I do not mean to confine myself to any specific plan of effecting this object, the manner of doing so, not in any way affecting the principle upon which my improvement is founded. This mode of construction is particularly adapted to wheels for locomotive engines, that run either on common roads or on rail-ways.

What I claim as my invention in my first described improvement, is the making the wheel of a rail-way carriage conical on its outer edge, and cylindrical between said conical part and the flanch, for the purpose of adapting it to run upon curved roads, and applying it thereto upon the principle, and in the manner, hereinbefore set forth.

What I claim as my invention in my second described improvement, is the substituting of metallic plates (generally of wrought iron,) for the spokes usually employed; and the giving to such plates a form which shall be convex, either curved or conical, from the rim to the hub of the wheel.

JOHN ELGAR.

Specification of a patent for Furnaces for Generating Heat by Friction, and applying the same to economical purposes. Granted to JOHN W. COCHRAN, *Lowell, Middlesex county, Massachusetts, November* 19, 1834.

To all whom it may concern, be it known, that I, John W. Cochran, of Lowell, in the county of Middlesex, and state of Massachusetts, have invented a *Friction Furnace* for generating heat without the consumption of fuel, and applying the same to economical purposes; and I do hereby declare that the following is a full and exact description of my said invention.

Although the fact that heat may be generated by friction is one of universal notoriety, it does not appear that the idea of applying this heat to economical purposes has ever been practically acted upon; I, however, have ascertained by satisfactory experiments that it may be done to great advantage. The most convenient way of effecting the object is to prepare two metallic disks, or cylinders, say of cast iron, in the form of common mill stones, and to cause one of them to revolve against the other, under considerable pressure, which pressure may be given by the weight of one of the disks, or by that of a vessel containing water, or other fluid, to be heated, the bottom of which may take the place of one of the disks; or by weighted levers, or in any other way of producing pressure which may be preferred. When I make two disks of this description to rub against each other, I form one or both of them somewhat hollow towards the centre, on the touching sides, as a bearing on that part would tend

to diminish the friction towards the periphery, where the motion is the most rapid.

There are many ways in which I contemplate the application of this principle, as, for example, I intend sometimes to cause two disks, such as I have described, to revolve, one against the other, by power derived from a water-wheel, or from any other convenient source, and to enclose them within a drum, or chamber, into which a current of cold air shall be admitted, and whence it shall be conducted by suitable tubes, after it has been heated by being brought in contact with the disks; thus using it to warm the apartments of any building, or for other purposes. Where steam is preferred, I intend sometimes to allow water to fall in a small stream upon the heated disks, and to conduct it thence through tubes to wherever it may be required. Where steam is to be generated to drive machinery, the bottom of the boiler may be made of suitable form, and to bear upon a disk revolving below it; or the bottom may be perforated to allow the shaft of a disk revolving in the inside thereof, to pass through, and to be turned by any suitable apparatus, by power derived from the steam generated by the heat from the friction, or from any other source.

These various modes will sufficiently illustrate the principle upon which I depend for rendering the heat which was latent, sensible, and active; but I do not intend by this enunciation to restrict, or confine myself to the form of apparatus herein described, or to the objects to which it may be applied, but to vary the same in any manner which I may find most convenient and efficient.

It may at first appear that the powerful friction necessary to engender sufficient heat to be usefully employed as a substitute for that extricated in the combustion of fuel, will produce a rapid wearing out and destruction of the rubbing apparatus; I, however, have ascertained, satisfactorily, that when the metals become heated, there is a degree of repulsion produced between them which admits of but little abrasion of their substance.

What I claim as my invention, and for which I ask a patent, is the application of the heat generated by the friction of pieces of metal against each other, to the purpose of heating air, generating steam, and, in fine, to all the economical purposes to which such heat is applicable, proceeding, in its production, upon the principles herein before set forth.

JOHN W. COCHRAN.

ENGLISH PATENTS.

To CHARLES WATT, *Surgeon, for his invention of a new or improved method, or process, of preparing tallow and stuff from fatty materials, and refining the same for the manufacture of Candles, and other purposes. Sealed September* 27, 1832.

This invention consists in subjecting the rough fat, tallow, stuff, or other fatty materials, to a process of boiling, with water containing a

weak solution of caustic alkali, simple, or compounded with ammonia: small quantities of alkaline solution being occasionally added during such boiling, and great care being taken to avoid saponification; and after the tallow has been liberated from the animal substances, containing gelatin, albumen, fibrin, and colouring matter, it is allowed to settle, and is then submitted to the action of boiling water containing a weak solution of acids, and is kept boiling by a gentle heat (steam being preferred) until the scum on the top of the tallow subsides; and after settling a few minutes, the tallow is again boiled in water, to wash out the acid.

In order that my process of preparing tallow may be better understood, I shall more minutely detail it, stating such proportions and quantities of water, alkalies, and acids, used to prepare and refine a given quantity of rough material, as I find best to answer the purpose; but I hereby declare that I do not intend to confine myself to the precise quantities and proportions herein stated, as it may be necessary to make some slight variation to suit the different kinds and qualities of the raw material; but I declare that the quantities and proportions herein stated are best suited to the average and ordinary kinds and qualities of the raw material.

Having put into the vat or melting vessel a quantity of water, in the proportion of about fifteen gallons to each hundred stone (of eight pounds per stone,) of rough material to be prepared and refined, the water is brought to the boiling point by the aid of steam admitted into the vat in any convenient way, or by the aid of any other means of imparting heat, steam heat being preferred, as it is not so likely to injure the body, texture, or colour, of the tallow, as the direct action of fire. I then introduce into the water in the vat or melting vessel, a solution of alkali, as potash, soda, &c. I prefer it to be caustic; or in lieu of such solution, I introduce into the water in the vat or melting vessel, a quantity of such alkaline earth, or earths, as lime, &c., as will answer the purpose, the solution containing about one pound and a half of alkali to the one hundred stone of fatty materials intended to be prepared or refined.

The rough fat having been previously chopped into small lumps, is then let down into the vat or melting vessel, and the whole is made to boil; and during the time it is in a state of ebullition, I add, occasionally, about as much more alkaline solution as will contain about a pound of alkali at each time; and this is to be added at proper intervals, namely, about every fifteen or twenty minutes. This process is to be kept up until the whole of the gelatin, albumen, fibrin, and other animal matter is detached, and until the lumps, or dabs, of fatty materials disappear, and the whole of the tallow rises to the surface of the water, taking great care that no saponification takes place during this process of boiling with the alkaline solution; but should this happen, more chopped fat, or fatty material, is to be added, until the tallow separates, which will be evinced by its rising again to the surface; the whole quantity of alkali required in this process to reduce and prepare a ton of fatty materials, not being more than about six or seven pounds. Sometimes, and more particularly

when the rough fatty materials are stale, I add about one pound of sub-carbonate of ammonia, or a pint of pure liquid ammonia, to the ton of fat, during this process of boiling.

After the rough materials are reduced to the state of melted tallow, that is, when the tallow is liberated from the gelatin, albumen, fibrin, or other gross materials, it is left to settle a short time, that is, until it becomes clear, and is then removed to the refining vat or vessel, which should be formed of wood, or such other material as acids, simple, or compound, do not act upon. Into the refining vessel I previously introduce sufficient water to cover the bottom of it to the depth of about two or three inches, and then add some diluted acid, and boil the whole, by steam, or otherwise, until all the scum on the tallow subsides. The diluted acid which I use to each ton of tallow, is about three pounds of sulphuric acid diluted with three gallons of water.

In the event of there being more rough materials to be melted or prepared, the water and alkali, (which, from being the heavier, will be found at the bottom of the vessel under the detached animal matter,) are to be pumped or drawn off, leaving in the melting vat or vessel the solid parts, lest they should contain some dabs or lumps of fat, or should, from their being thick, retain some melted tallow among them. Fresh water, in quantities as at first, and alkaline solution, or alkaline earth, as before mentioned, are then to be added, and the process to be regulated precisely as before; when the whole quantity is completed, then the under water is to be again pumped or drawn off, and if any dabs or lumps remain, fresh water is to be added to them, and alkaline solution in half the quantity to that employed upon the fresh fat: regulating that quantity according to the amount of dabs or lumps remaining.

The solid, or gross parts, left after all the tallow is reduced, and liberated therefrom, may be dried by a gentle heat, and pressed into greaves, or used for any other purpose for which animal matter is adapted.

The scum being boiled down, the second part of my process is a good criterion that the tallow is in a fit state to settle. When the tallow has been boiled with the diluted acids, in the second part of this process, and has sufficiently subsided, it is conveyed to another vessel, where it is submitted to the action of boiling water for a few minutes, which will wash the tallow free from any acid that may be mixed up with it. The water in this vessel is also boiled by steam, and if the ebullition should not be sufficient, it may be kept stirred up during the time it is boiling; and when the tallow has sufficiently settled after this third boiling, it is drawn off into the coolers, and when properly reduced in temperature, may be packed off in the usual manner.

I prefer the use of steam heat to boil the materials in my improved process, as it is not so likely to injure the body, colour, or texture, of the tallow. [*Lond. Jour.*

To William Gratrix, *silk dyer, for his invention of an improved method of imparting to various woven fabrics, or to the yarns or threads of which the same are intended to be composed, the colour necessary to form the required patterns thereon. Sealed January* 5, 1833.

The invention described under this patent, is for a new method of applying the colour to piece goods in general, and is effected by the following means: the pattern with which the goods are intended to be wrought, is first cut out of a thin sheet of copper, tin, or other metal, or mixture of metals, or it may be cut out of a square of silk, stout paper, or any material which is suited to the purpose, but which must first be rendered impermeable to the colour by oils, varnish, &c. The sheet, with the pattern cut out of it, is then to be mounted on one side of a frame, and the flat side of the frame and sheet placed upon the silk, or other piece goods to be wrought with the intended patterns, which goods must be previously stretched upon a plane or table fit to receive them; the colour is then rubbed over the whole surface of the sheet of metal containing the pattern, with a brush or otherwise, (in the manner of stencilling,) or the colour may be communicated through the medium of a felt absorbed with colour, and subjected to a slight pressure, such as the blow of a hammer, or a gentle pressure in any other way. This process will leave the pattern only upon the goods, the intervening surfaces of the sheet preventing the colour from marking any part of the goods but those exposed by the removal of part of the sheet of metal in cutting out the pattern.

It must be quite evident that this process is the mere adaptation of the art called "stencilling," to piece goods; which process has been adopted generally for many years, as a cheap mode of covering walls of rooms with patterns, to supersede paper hanging. It is also evident that this process would produce much the same effect as block printing in common, as many colours may be worked upon the same ground by the intervention of surfaces, containing different patterns cut therein, to suit the different colours and shades required for the completion of the pattern upon the piece goods. [*Ibid.*

To William W. Taylor, *felt manufacturer, for his invention of an improved cloth for the sails of ships and other vessels. Sealed November* 8, 1832.

This invention consists in the application of a cloth or fabric made of hair, for constructing sails for ships or other vessels. The hair used for this purpose may be of such kind as is cheapest, and commonly found in the market, as ox and cow hair, which is usually employed by mixing it with mortar for plasterers' use, the short staple hair of horses, and that of the calf, the elk, or any short staple hair that may be found useful for the purpose.

The hair is combed and carded, as in woollen manufactures in ge-

neral, then taken off in slivers, and after being spun into yarn, it is to be wove into cloth or fabric by means of a common hand loom, or otherwise.

The patentee prefers that the warp threads should be made of two threads or yarns doubled or twisted together, and that the weft should also consist of two threads twisted together, that mode being the strongest and by far the most preferable. The cloth, or fabric, is to be subjected to the process of fulling, as usual in woollen manufactures, which will render it a perfect material, and capable of holding the wind as well as the common sail cloth made from hemp or flax, if not much better. Sail cloth made in this manner, and of this material, will not be subjected to the ill and rotting effects of mildew, damp, &c., but will perfectly resist the same.

The cloth, or fabric, is to be cut up and made into sails of the suitable and required shape, and the parts, or pieces, are to be sewn together by a thread made of similar hair to the cloth, and should also consist of two threads doubled or twisted together.

Sails made upon this improved plan will be totally free from the danger of the effects of damp, mildew, &c., which is the cause of the rotting of the sails now in use. [*Ibid.*

To Sherman Converse, *gentleman, for an invention communicated to him by a certain foreigner residing abroad, for certain improvements in making or manufacturing metallic rails, for the construction of rail-roads. Sealed September* 29, 1832.

The improvements in rail-roads, described in the specification of this patent, is the application of longitudinal bars of iron, placed as tension rods under the rail, and from chair to chair successively, through the whole length of the line of rail-roads, so as to secure the chairs longitudinally; and also in the application of cross tension rods, or stretchers, to be placed transversely between the chairs and rails, so as to connect the whole crossways, and form a perfect security throughout the line; these cross tension rods acting at the same time as a stay and a brace; the whole being firmly connected by bolts, and secured by screw nuts, wedges, or otherwise, as may be found the most desirable, in the application of the same. [*Ibid.*

¶ *Magnetic Experiments on Chronometers.*

(Concluded from p. 208.)

The result of our experiments, however, with our patent balance, was sufficiently satisfactory to persuade us that we had entirely obviated the difficulties under which we previously laboured when the steel balance was employed. We then proceeded to apply it to a chronometer, and, with a view to establish our opinions of its correctness with still greater certainty, we resolved to follow up the question of magnetism by inquiring how far the rate of a chronome-

ter was influenced by the interference of an artificial magnet, when the old and new balances were applied. We accordingly made two chronometers on the old principle, the balance and spring in one of them being composed of steel, with a brass outer circle, and the other a patent balance of steel. We then made two on the new principle, with a gold spring, and a balance of platinum, silver, and brass, and assuming the non-magnetic power of these latter chronometers, and with a view to determine the relative magnetic influence exerted on the steel spring and steel balance respectively, we had one chronometer with a steel balance and gold spring, and the other with a steel spring, and balance of platinum and silver. In the former case, the deviation in rate would be attributable to the steel balance, and in the latter to the spring. Six other chronometers, varying in the different alloys employed in the gold spring, and other particulars, were constructed, and the twelve were, by permission of the Lords of the Admiralty, placed at the Royal Observatory for trial. The majority of these being entirely new chronometers, and, in fact, all of them, except 521, being made within the last two years, we were desirous, previous to the application of the magnet, &c., to have five or six months' rates, and the results were published in your Magazine for February.

After this trial, we chose out of these twelve chronometers some constructed on the principles above mentioned, with a view to place them in contact with the magnet. Those selected were Nos. 606, 605, 615, 657, 600, and 274.* No. 606 and 605, have gold springs, and balances of platinum, silver, and brass. Nos. 615 and 657, have steel springs and steel balances. No. 600 has a steel spring, and balance of platinum, and silver: and, lastly, 274 has a gold spring and steel balance. It may be necessary to remark, that No. 615 has a patent balance, the upper bar of steel, and the lower bar of brass; and this circumstance will account for the difference in the effect produced upon this chronometer, and No. 657, which has a balance on the old construction, with an arm *entirely of steel*, and the inner circle a rather stout lamina of steel, and the outer of brass. The steel bars employed, marked in the table of experiments A B and C, were each 16.12 inches in length, 1.68 inch in breadth, and 0.44 inch in thickness, and were strongly magnetised.

Great care was taken, when the magnets were not employed, to preserve their virtues uninjured. They were therefore placed in a deal box, to keep them from the dampness of the atmosphere, though, from their highly polished state, they could not contract much rust, and their opposite poles were connected by two bars of soft iron, so as to form, when in this position, the figure of a parallelogram.

It will here be necessary to recapitulate a part of our former statement relative to the particular construction of the several chronometers, before we enter into the experiments themselves, to which they have been subjected, in order that the object proposed by us in them

* The chronometers here mentioned, that were not on the trial, were constructed during that time purposely for this experiment.

may be more clearly shown, and the means employed to develop certain anticipated results may be sufficiently developed.

It must be recollected that the problems we have endeavoured to solve have been, first, to ascertain the influence of magnetism on the balances and springs of chronometers constructed on the common principles; and, secondly, assuming its existence in the former case to prove its non-influence on chronometers constructed on principles suggested by our own experience. For these purposes, therefore, the following variety in the mechanism of chronometers became necessary:—First, to prove the affirmative, that magnetism influenced chronometers, by trying two balances and springs with the usual metal, steel; and, secondly, to establish the correction of this, by producing two balances and springs composed of such metals that the rate of the chronometer should not be effected; and, lastly, acting on the presumption, that the steel balances and springs alone would indicate changes in their performance, and with a view to ascertain the influence exerted in the balance and springs respectively, a third and fourth variety suggested themselves, whereof the former was to make the balance alone of steel, and the spring of the unmagnetised metal, and the latter was the converse of this. The process which has been adopted to obtain the required results has been simply this: the arm of the balance, when in a state of rest, as has been before stated, lies exactly in the direction of a line passing through the six and twelve hours, and these, with the three and nine hours, have been the chief points to which the magnets have been applied. The bars themselves at the commencement were placed in the magnetic meridian, and were kept in that position unmoved throughout the whole series of experiments. The chronometers were then presented to the magnets, the extended axes of the bars, which were perfectly horizontal, passing through the centre of the balances.

For the sake of uniformity, the six hours of each chronometer were first presented, and subsequently the twelve, three, and nine hours, commencing at a distance of seven inches, but eventually this was reduced to three inches.

In the case of No. 657, for instance, the north pole of the balance having been ascertained to lie under the six hours of the chronometer, (for either the north or south pole must in all chronometers lie under this point,) this part of the balance was first presented to the south end of the magnet, at a distance of seven inches; and, as will be seen, the rate is affected about twenty-two seconds per diem in this position of the chronometer. The distance was then diminished to three inches, and the increase in the rate is correspondent to the change in the relative distance of the chronometer.

It must be observed, that each end of the arm of the balance in its vibrations describes an arc of 180°, sometimes more and sometimes less, the north and south ends alternately subsiding at three and nine hours. Suppose the balance now to lie in a state of rest, the north end being in juxtaposition with the south end of the magnet, so that their action, the one on the other, is mutual. The mechanism of the chronometer being applied, the north end of the balance is carried to

the nine hours, whilst the south end is brought under the three hours. The south pole of the magnet now attracts the north, and repels the south end of the balance, so that the conjoined influence of these forces causes the vibrations of the chronometer to accelerate, and the chronometer gains. Reverse this order, and let the twelve hours, or the south end of the balance, be in the vicinity of the south end of the magnet. Here the repulsive force which is exerted by the south end of the magnet upon the south end of the balance has the tendency to retard the vibrations, but on account of the impossibility of placing the magnet at equal distances from the centre of the balances, from their not being situated exactly in the centre of the chronometer, the comparison of the effects produced on the rates in different positions is rendered uncertain. The disposition of the result, however, at the six and twelve hours, are, as should be expected, contrary in their nature, and the three and nine hours position indicate a mean between these, and are quite consistent with each other in their relative effects.

The same reasoning will apply to the effects produced on No. 615. The results in this case are indeed not so satisfactory as in the former, but a special reason has been already assigned to account for the difference.

It will be gratifying to observe the constancy in the rates of the two chronometers, Nos. 605 and 606, although subjected to the same trial as Nos. 615 and 657. We confess that there is some slight appearance of an effect having been produced by the magnet in these chronometers. It would of course have been presumptuous not to have anticipated some change. The metals employed in their balances are chiefly brass, platinum, and silver. Now brass, which is compounded of copper and zinc, under particular circumstances, is very manifestly susceptible of magnetism. In the Philosophical Transactions for 1786, page 62, Cavallo has confirmed this statement by producing instances which place the matter beyond conjecture. The same philosopher has also asserted, that platina shows magnetic phenomena in a proportion nearly equal to that of brass. In fact, all metals have been supposed, more or less, to exhibit this peculiar property. It will be observed, that the effect increased in proportion to the duration of the cause, which appears to accord exactly with a recently established principle, that time is an element in the acquisition of magnetic polarity, produced by induction, as well as for its loss, when the substance in which this induction has taken place returns to its original neutral state, by the subtraction of all extraneous influence. The removal of the magnetised bars from these two chronometers accordingly was not immediately followed by a change in their rates, but a gradual approximation to their former mean rate is discernible. But this is not the case with the two chronometers having steel balances, and the fact may be explained very easily, by considering that in the case of the steel balances the application of the artificial magnets was only an extension of an effect which in some measure was previously caused by the force of terrestrial magnetism. The magnet only increased this effect by certain quantities

which were neutralised by the removal of the extra cause, and the original force produced by the earth alone retained its influence. But the case of the brass, &c., balances is widely different. Previous to the application of the magnet to these, no discernible effect was produced by magnetism: but when they were brought into the vacinity of the magnets, they were in the course of time made to possess their peculiar virtues. On the removal of the magnets, the properties they had induced were still inherited by the balances, and their polarity having been established, they now acknowledged the force of terrestrial magnetism.

Whilst this power in the balance continued, the rate of the chronometer would of course deviate from its original state by the difference which the effect induced by the magnet, (and which was now only kept up by the earth,) could produce.

The gradual decrease of this polarity is manifested by a gradual decrease in the effect produced on the original rate.

We now proceed to lay before you the rates of these several chronometers, which have been taken at the Royal Observatory with the greatest care. As far as possible, they have been compared at equal intervals of twenty-four hours, so as to produce the true daily rate.

In those cases where this has not been attended to, the proper allowance has been made, and the rates reduced to one common epoch. The thermometer is added, and the maximum and minimum obtained from the Royal Observatory records for each day, have been preferred to the registered degrees usually made at the time of comparison.

Day of Month.	CHRONOMETERS' RATES.				THERM.		REMARKS.
1833.	No. 657.	615.	605.	606.	Max.	Min.	
	m. s.	m. s.	s.	s.	°	°	
Jan. 16	— 9.1	— 8.1	— 0.1	— 2.9	40	35	
17	9.4	8.1	+ 0.3	3.3	40	35	These are the rates of the chronometers previous to the application of the magnets.
18	8.5	7.4	0.1	2.5	39	34	
19	8.5	6.7	0.1	3.2	36	33	
20	7.4	7.6	+ 0.2	3.3	38	27	
21	7.2	6.9	— 0.4	3.1	33	26	
22	7.3	7.1	+ 0.4	4.0	32	23	
23	+ 14.7	+ 3.2	— 0.2	3.6	35	20	The magnets were here applied at a distance of 7 inches from the chronometers in the following order:—
24	16.5	3.5	+ 0.2	3.1	36	24	
25	20.0	0.3	0.1	2.9	33½	24	Magnet A, south end to 6 hrs. of No. 615, and
26	18.6	4.3	0.2	3.3	39	29	north end to 6 hrs. of No. 605.
27	12.1	3.8	0.4	2.9	41	31	Magnet B, south end to 6 hrs. No. 657, and north end to 6 hrs. No. 606.

Day of Month. 1833.	CHRONOMETERS' RATES. No. 657.	615.	605.	606.	THERM. Max.	Min.	REMARKS.
	m. s.	m. s.	s.	s.	°	°	
Jan. 28	+34 35.8	+ 11.4*	0.9	2.6	43	36	The distances of the magnets decreased to three inches. Order of position as before. * The centre of the balance was found to be below the line of the axis of the magnet; it was therefore raised the required quantity.
29	38 3.4	12.7*	1.0	2.6	40	35	
30	39 3.7	15.5*	0.9	3.1	37	35	
31	38 27.3	+1.13.0	0.8	3.0	36	28	
Feb. 1	39 15.0	1.17.5	+1.2	3.0	36	32	
2	35 54.4	1.16.2	—0.5	4.3	52	30	
3	37 20.7	1.12.0	+0.3	3.4	50	31	
4	—4 5.3	— .4.7	—1.1	4.3	54	39	Order of position changed.--Magnet A, south end to 12 hrs. No. 615, and north end to 12 hrs. 605. ... B, S. end to 657, N. end to 606. Distance of Magnet 3 ins.
5	1 14.2	3.8	1.6	4.7	54	49	
6	8 49.0	4.4	1.1	4.4	50	48	
7	4 4.2	4.9	0.5	4.5	56	44	
8	3 48.8	5.4	1.0	4.7	53	42	
9	3 20.5	4.0	1.6	4.0	45	38	
10	13 8.0	3.8	1.7	4.7	47	34	
11	+5 2.0	+ 4.6	1.8	4.0	52		Order of position changed.--Magnet A, south end to 9 hrs. No. 615, and north end to 9 hrs. 605. ... B, S. end to 657, N end to 606. Distance of Magnet 3 ins.
12	8 23.3	6.0	0.9	4.7	53	39	
13	8 20.0	6.2	1.0	4.0	51	39	
14	5 47.2	8.0	1.8	5.0	48	40	
15	5 42.0	10.5	1.6	5.0	42	35	
16	+5 43.6	+ 5.3	1.7	4.6	42	29	Order of position changed.—Magnet A, south end to 3 hrs. No. 615, and north end to 3 hrs. of 605. .·. B, S. end to 657, N. end to 606. Distance of Magnet 3 ins.
17	4 0.7	5.3	1.7	5.9	50	31	
18	5 3.7	6.4	1.6	5.8	46	36	
19	5 11.5	6.0	1.5	6.0	46	35	
20	9 17.2	7.1	1.9	5.8	44	40	
21	— 7.2	— 6.8	1.7	5.3	46	38	Magnets removed.
22	7.0	6.3	1.0	6.0	44	38	
23	7.3	6.5	1.3	5.8	43	35	
24	7.0	6.0	1.3	5.7	47	30	
25	7.1	5.4	1.7	5.0	48	35	
26	6.8	6.0	1.0	4.7	50	35	
27	6.4	6.0	1.2	4.8	48	35	
28	6.4	6.1	0.5	4.0	46	31	
Mar. 1	6.5	5.3	0.0	4.0	47	34	

The fact, then, of the ill effects produced by the usage of steel in the balance and spring being established, we will show how far the evil is felt on each of them respectively. The chronometers employed on this occasion were well calculated for the purpose, as will

be seen by consulting the few daily rates given previously to the application of the magnet.

The same process has been adopted in these as in the other experiments. The utmost care has been taken in comparing the chronometers; in fact no error of 0s,1 can in any instance have arisen.

The particular construction of these chronometers has been already explained—it may, however, be advisable again to state, that any change produced in No. 600 by the interference of the magnet is to be attributed to the steel spring, and in No. 274 to the steel balance. As might be expected, the effect of the magnet on the chronometer with the steel spring is by no means proportionate to that with the steel balance, which indicates changes quite analogous to those explained in the rates of chronometers 615 and 657.

Daily rates of Messrs. Arnold and Dent's Chronometers, 1833.

DAY.	Chrn. 600. Bar. C.	Chrn. 274. Bar. C.	REMARKS.
	s.	m. s.	
Jan. 17	+ 0.1	+ 1.0	Rates taken previous to the application of the Magnetic Bar.
18	0.1	1.0	
19	0.3	1.5	
20	— 0.6	1.6	
21	+ 0.1	1.5	
22	— 0.1	1.3	
23	+ 0.1	1.7	
24	— 0.1	1.5	
25	— 0.9	1.2	
26	— 1.2	1.3	
27	— 0.8	1.2	
28	— 0.5	1.3	
29	— 1.2	1.0	
30	+ 3.3	+2 53.0	Magnet C, north pole to 6 hrs. of 600.
31	2.5	3 10.7	........., south .... 6 hrs. of 274.
Feb. 1	3.3	2 56.3	Distance of bar = 3 inches.
2	4.0	2 38.5	
3	3.2	2 39.0	
4	— 2.0	— 1.12	Magnet C, north pole to 12 hrs. of 600.
5	3.3	4.8	........., south .... 12 hrs. of 274.
6	3.3	4.9	Distance of bar 3 inches.
7	3.7	6.3	

DAY.	Chron. 600 Bar. C.	Chron. 274 Bar. C.	REMARKS.
	s.	s.	
Feb. 8	+ 0.8	+ 10.5	Magnet C, north pole to 9 hrs. of 600.
9	0.6	10.0	........., south ...... 9 hrs. of 274.
10	0.7	10.5	Distance of bar=3 inches.
11	1.0	10.5	
12	1.2	10.3	
13	1.0	10.8	
14	1.1	17.2	
15	1·1	17.3	
16	— 1.4	+ 21.0	Magnet C, north pole to 3 hrs. of 600.
17	2.0	20.0	........., south .... 3 hrs. of 274.
18	1.2	20.8	Distance of bar=3 inches.
19	0.8	20.0	
20	1.0	12.9	
21	1.2	20.3	
22	1.2	20.7	
23	0.8	20.3	
24	0.8	20.4	
25	— 0.6	+ 2.7	Bar removed.
26	0.3	2.5	No. 274, 6 hrs. to north. s.
27	0.5	3.5	.... Mean rate for 3 days=2.9.
28	— 0.5	+ 1.5	.... 6 hrs. to south. s.
Mar. 1	0.8	2.0	.... Mean rate for 5 days=1.5.
2	0.9	1.7	
3	1.0	1.8	
4	1.0	0.5	
5	— 0.6	+ 2.5	.... 6 hrs. to north. s.
6	0.5	2.7	.... Mean rate for 3 days=2.8.
7	0.4	3.0	
8	— 1.0	+ 1.5	.... 6 hrs. to south. s.
9	1.2	1.7	.... Mean rate for 3 days=1.6.
10	0.7	1.8	
11	— 0.7	+ 3.1	.... 6 hrs. to north. s.
12	0.6	3.0	.... Mean rate for 3 days=2.9.
13	0.8	2.7	

On the removal of the bar, the rates of No. 274 were taken in different positions with respect to the north and south points of the horizon. The sensibility of the chronometer to be effected by these variations in its positions is very evident, and immediately corroborates an assertion which we made of this kind in the first part of our letter. Taking the mean of the three positions, with the six hours to the north, which equals + 2s.9 per diem, and the mean of the two positions with the six hours to the south, which equals + 1s.5 per diem, the difference produced by these changes amounts to 1s.4.

We trust it will be unnecessary to intrude any farther on your

time in endeavouring to establish the point we set forth with, that magnetism affected the rate of a chronometer. We have not worked out our results by any abstruse formula, as the experiments required no such assistance. The simple matter of fact is here stated, and if we have not succeeded in fully developing our plans and modes of proceeding, we venture to hope that the novelty of the experiments, together with the extreme difficulties which always attend innovations on an old established principle, may be our sufficient apology.

With every acknowledgment, Mr. Editor, for the attention which our experiments for the improvement of science have met with at your hands, we beg leave to subscribe ourselves,

Your very obedient servants,

ARNOLD & DENT.

Observations as to the cause of the Spontaneous Combustion of Charcoal, in reference to Colonel Aubert's and Mr. Hadfield's experiments. By Mr. F. COXWORTHY, of the Ordnance Department. Dated London Mechanics' Institution, January, 1832.*

The spontaneous combustion of carbonaceous substances is a phenomenon which has long been under consideration, not only in respect to charcoal, but also of that body mixed with oil, of flax, hemp, hay, and others; and although numberless experiments have been made, no one, to my knowledge, has ever advanced an opinion as to the cause, which, in respect to charcoal, I consider as being solely attributable to the decomposition of moisture by potassium.

When it is considered that the oxidation of metals is difficult in proportion to their being protected by the earths or other substances, as is show by iron, during the process of copper smelting, it will not appear strange that potassium, notwithstanding its great affinity for oxygen, should be preserved in its metallic state in a mass of charcoal; which being admitted, its action on moisture may be explained by the following rationale:—

$$\begin{array}{c} \overbrace{\hphantom{\text{Oxygen}\qquad\qquad\text{Potassium}}}^{\text{Hydrogen (possibly potassiuretted.)}} \\ \begin{array}{c}\text{Hygrometric}\\ \text{moisture.}\end{array} \left\{\begin{array}{l}\text{Oxygen}\\ \text{Hydrogen}\end{array}\right. \begin{array}{l}\text{Carbon}\\ \text{Potassium}\end{array}\left\}\text{Charcoal.}\right. \\ \underline{\hphantom{\text{Oxygen}\qquad\qquad\text{Potassium}}} \\ \text{Carbon and potash.}\end{array}$$

The moisture, when admitted to the potassium, becomes decomposed, its oxygen combining with that metal, while the hydrogen being liberated, continues ascending towards the surface until it reaches the influence of atmospheric pressure, where it is stopped so long as its elasticity is insufficient to overcome it, and escaping only, when, by accumulation and increase of temperature by chemical action, it

* See this Journal for November last.

has obtained sufficient force to do so, thus presenting at once a considerable body of gas to the action of the oxygen contained in the atmosphere. In this opinion, I cannot but consider myself as being fully borne out by the results of Mr. Hadfield's and Colonel Aubert's experiments.

Mr. Hadfield's first two experiments show, that old charcoal which had been long exposed to the action of a damp atmosphere did not rise to so high a temperature as new, which, on the above assumption, could not possibly be otherwise, for a portion of the potassium having already become oxidated, the remainder could not be capable of causing so great an action, by the decomposition of water, and liberation of its heat, as that which has not undergone a change.

Combustion taking place generally near the surface—next to the wall when charcoal is placed against one—and reignition twenty-four hours after the fire had been extinguished by water; as well as long jets of fire proceeding from charcoal, on its being tilted from a cask, may all be adduced in support of my views, to which may be added that in Mr. Hadfield's experiments, which he performed with coarse charcoal, combustion generally took place six inches below the surface; whilst Colonel Aubert's charcoal, being considerably finer, took fire short of two inches of the surface.

If the above conclusions are correct, it will be no longer a matter of surprise, that a thermometer placed in a bad conductor of heat, (lead,) and surrounded by one of the very worst, (charcoal,) should be but slightly affected, while combustion was actually going on within six inches of it. [*Rep. Pat. Inv.*

Resistance of Fluids to Bodies passing through them.

The following notice has recently appeared of a paper entitled "An Account of a Second Series of Experiments on the Resistance of Fluids to Bodies passing through them;" by James Walker, Esq., F. R. S., Civil Engineer; which was read before the Royal Society, on June 6th, 1833.

The author, in a paper read to the Society in the year 1827, and printed in the Philosophical Transactions, gave an account of some experiments showing that the resistance of fluids increases in a ratio considerably higher than the square of the velocity, and that the absolute resistance is smaller than had been deduced from the experiments of the French Academy. In the present communication, he states the results of his further inquiries on this subject. His experiments were made at the East India Docks, on a boat twenty-three feet long and six wide, with the stem and stern nearly vertical; one end being terminated by an angle of forty-two degrees, and the other of seventy-two degrees; and the resistance to the boat's motion being measured by a dynamometer. The results are given in tables; and it appears from them that in light vessels sharpness is more important in the bow than in the stern; but that the reverse is the case in

vessels carrying heavy cargoes. From another series of experiments the author infers that the resistance to a flat surface does not exceed 1.25 lb. for each square foot, at a speed of one mile per hour; increasing for greater velocities, in a ratio considerably higher than the square of the velocity. The author concludes with some observations on the results lately obtained in Scotland, where great velocities were given to boats moving on canals, without a proportional increase of resistance.—*Proceedings of Royal Society.* [*Ibid.*

Decease of the Inventor of the Steam Press.

The German papers announce the death of Frederick Kœnig, on the 17th ultimo, at Oberzell, near Wurtsburg. He was the inventor of the mechanical presses, upon an entirely new principle, which he, in conjunction with his friend Bauer, of Wirtemburg, first brought into use for the *Times*, of London. The steam presses of the *Augsburg Gazette* were also constructed by them. For the last fourteen years they have had an extensive manufactory at Oberzell.

CELESTIAL PHENOMENA, FOR MAY, 1834.

Calculated by S. C. Walker.

D.	H.	M.							
5	21	23	☿	☌	☽		☿ North 2°.0		
9	12	31	♀	☌	☽		♀ North 2°.3		
17	7		♀	☌	ι Tauri		♀ North 1°.9		
18	6	57	♄	☌	☽		♃ South 2°.8		
23	13	45	☿	☌	♃		☿ South 4′.0		
10	7	5	Im.	(282)	Tauri	,7,	N114°	V165°	
10	8	0	Em.				250°	303°	
17	13	20	Im.		ν Virginis	,4. 5,	185°	237°	
17	13	40	Em.				229°	282°	
21	14	03	Im.	32	ζ¹ Libræ	,6,	118°	141°	
21	15	17	Em.				300°	297°	
21	16	00	N. App.	☽ 34	ζ³ Libræ	,6,	☽ South 0′.3		
21	16	39	Im.	35	ζ⁴ Libræ	,6,	154°	206°	
21	17	23	Em.				240°	292°	
22	9	7	Im.	(28)	Scorpii	,7,	151°	116°	
22	9	35	Em.				225°	185°	
25	12	37	Im.	(47)	χ Sagittarii	,6,	150°	128°	
25	13	02	Em.				218°	193°	
27	12	18	Im.	28	φ Capricorni	,6,	127°	265°	
27	13	1	Em.				190°	219°	

Cement for Glass and China.

Take an ounce of pure gum mastic, which dissolve in a sufficient quantity of alcohol. Soak 1 ounce of Icthyocolla, or fish glue, in water until it is soft, and dissolve it in alcohol; mix the two solutions together, and add to them one-fourth of an ounce of gum ammoniac; heat the whole until it is thoroughly incorporated, and pour the cement into a phial. When it is to be used, warm the phial, and also the article to be cemented. This cement dries quickly, and adheres firmly.

Meteorological Observations for February, 1834.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	32°	34°	29.80	29.80	NE. E.	Blustering	0.53	Cloudy—rain.
	2	32	34	.80	30.00	W.	Moderate.		Clear day.
	3	32	44	30.13	.10	W.	do.		Clear day.
	4	31	44	29.72	29.65	SW.	do.		Clear—flying clouds
	5	32	49	.65	.65	W.	do.		Clear day.
	6	37	49	.70	.80	W.	do.		Clear day.
	7	33	32	.75	.80	E.	do.		Cloudy—flying clouds.
⊗	8	20	33	30.20	30.10	E.	do.		Cloudy—lightly cloudy.
	9	32	33	29.85	29.75	S. E.	do.	0.95	Cloudy—rain.
	10	35	40	.80	.90	N. E.	do.		Cloudy day.
	11	35	48	.90	.85	W.	do.		Cloudy—flying clouds.
	12	30	28	30.10	30.15	NW.	do.		Clear—cloudy.
	13	22	30	.10	.10	W.	do.		Clear—flying clouds.
	14	34	50	29.80	29.75	S. W.	do.		Clear day.
	15	48	65	.60	.50	S. SW.	do.		Cloudy—flying clouds.
☾	16	45	49	.70	.80	NW.	Brisk.		Cloudy day.
	17	38	40	30.10	30.20	E.	Moderate.		Cloudy day.
	18	29	45	.35	.40	NW. S.	do.		Clear day.
	19	33	54	.30	.10	SE.	do.	0.43	Cloudy—rain,
	20	43	56	29.90	29.95	W. SE.	Calm.		Clear—hazy.
	21	33	54	.95	.90	S.	do.		Clear day.
	22	44	51	.90	.90	SE.	do.		Cloudy day.
☺	23	49	53	.80	.65	SE. E.	do.	0.47	Rain.
	24	43	49	.80	.80	W. SE.	Moderate.		Cloudy—drizzle.
	25	40	43	.65	.65	SE.	do.	0.30	Drizzle—cloudy.
	26	29	36	.84	.90	W.	Blustering		Flying clouds—cloudy.
	27	26	45	30.05	.90	W.	do.		Clear day.
	28	31	47	29.70	.70	W.	do.		Clear—cloudy.
	Mean	34.57	44.11	29.89	29.88			1.98	

	Thermometer.	Barometer.
Maximum height during the month,	65. on 15th.	30.40 on 18th.
Minimum do.	20. on 8th.	29.50 on 15th.
Mean do.	39.34	29.88

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

MAY, 1834.

Information to Inventors who wish to obtain Patents in England. By the Editor.

Inquiries are frequently made of the Editor, by persons who wish to secure patents in England and France for their inventions, and it has been his design to give some general information upon that subject in the Journal. The present article, however, is not considered as fulfilling this intention, but merely as bringing to notice one point of considerable importance in the business. The patent law of the United States provides for the granting of patents to inventors, only, or to their heirs, administrators, or assignees; and a patent obtained by any other person, is invalid. In England, patents are granted for what is *new there,* without regard to who was the inventor of it; if invented in a foreign country, the term new, applying to its novelty in the realm. Whoever, therefore, first takes a new invention to that country, can obtain a patent, and defend his right. It consequently becomes a point of great importance, that those inventions which are deemed worth the expense of an English patent should not be divulged here before steps have been taken to secure the right on the other side of the Atlantic.

The Editor has, in several instances, prepared and transmitted the requisite papers to England, his situation being such as to offer special facilities for so doing. Owing to this, and to his general pursuits, he has become the depository of more information respecting the modes of procedure than has fallen to the lot of most other persons; his

connexion with the Patent Office of the United States, also, brought to his notice many things calculated to throw light upon this subject.

There are many persons who make it their special business to visit the United States' Patent Office, that they may be able to turn the inventions of others to their own advantage, either at home or abroad; at home, by making some unimportant change in the form of machines that they see there, and then diffusing them in some part of the Union remote from the residence of the original inventor: abroad, by sending to England and France, accounts of such inventions as they believe will sell in those countries.

This subject has been brought afresh to the notice of the Editor, by a letter received from a correspondent in New York, Wm. Serrell, Esq., Civil Engineer; a gentleman from England, and who was frequently employed there in preparing specifications and drawings for the Patent Office; and who has, in several instances, been engaged by American inventors in the same business. In a letter dated March 3d, in which he mentions this fact, he observes, that, "The short period since my first agency of this kind, and the little publicity I have yet sought, are reasons why the number of these transactions is yet small. Still I have the pleasure to say that late arrivals bring advice from my friend in London, that two of such patents are in progress towards profitable sale; but I regret to add, the same letter states that one patent is likely to be interferred with, if not set aside, through some circumstances that will be fully understood by the annexed extract from the letter itself, which extract I hand you, believing that you may consider it of sufficient importance for insertion in your excellent Journal."

Extract from a Letter dated "London, 14th December, 1833."

"It may be of use to apprize inventors of mechanical improvements in the United States, that it is essential to the security of their interests, if they design to take out patents for their inventions in this country, not to disclose the secret of their inventions in the United States, until they have secured a patent here. There are many ingenious mechanics in the United States in correspondence with their friends in this country, constantly on the watch to sieze any thing new, and likely to be useful, to transmit the particulars to their friends, and thus forestall the rights and interests of the original inventor."

As a commentary upon the foregoing extract, the following fact may be stated. An American had obtained a patent in the United States, and had assigned the right thereto, in England, to a fellow citizen for twenty thousand dollars; the assignee, however, arrived there too late, as some one had obtained the description from the office here, had transmitted it, and obtained a patent.

There is now before the British Parliament a new law to regulate the granting of patents. It passed the House of Commons at the last session, and was read a second time in the House of Lords, but the Lord Chancellor, wishing to examine its details with more care than

was then possible, it was postponed. It will undoubtedly be completed at an early period; when we shall give its provisions, with such other matter respecting foreign patents, as may appear to us important.

Observations on the Explosion of the Boilers of the Steam-boat New England. By THOMAS EWBANK, *of New York.*

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

Although the explosion of these boilers is, as I believe, justly attributed to an excessive pressure of steam, there is room to suppose that one remote source of the calamity may be found in the inferior quality of a portion of the copper of which they were formed. The grain or texture exhibited in several parts appeared to me on examination to be very different from that of good malleable copper. In order, however, that its quality may be more fairly tested, I have transmitted to the committee of the Franklin Institute on explosions* specimens taken from different parts of the boiler, that they may be essayed by the apparatus of the Institute adapted to that purpose. Of these specimens No. 1 is from the inside ridge of one of the furnace doors. See *j* in fig. 1 of the cuts attached to the report of the Board of Examiners.† Nos. 2 and 3 are from the joint of the vertical flue, or steam chimney, where it was connected to the horizontal flues. This vertical flue was formed of iron, the oxide of which may be seen on one side of these specimens. This joint was two or three inches above the horizontal flues, or about on a level with the lowest gauge cock. No. 4 is from one of the water legs. No. 5, I took from the outside of one of the boilers, near the centre of its length, and on a level with the top of the arches. No. 6 formed part of the shell or roof. The quality of this appears very bad. No. 7 is similar to No. 5. No. 8 formed part of one of the stays.

It should be observed that as No. 6 is from the roof, or shell, and therefore entirely remote from the influence of the fire in the furnace, or flues, it could not be injured by heat from them. In originally forming this part of the boilers, there could be no necessity for annealing the copper, as is the case in working several of the other parts. The quality of the copper from which this specimen was taken, could not therefore be injured by the makers of the boilers, and any defect in it is not attributable to them.

If the metal had been overheated in the process of its manufacture, as is sometimes the case, its malleability would, in a great measure, have been destroyed, even when in an annealed state, and as it was *hard rolled*, it would of course have been rendered still more brittle. Judging from the appearance of the fractures of several specimens, and especially of those which have broken without previous indentation, such as No. 6, it would seem that the copper was either alloyed, or that its tenacity was injured in manufacturing.

* See minutes of the monthly meeting of the Institute for February of this year, p. 159, vol. xiii.—COM. PUB.

† See this Journal, page 58, vol. xiii.

The ordinances of France relating to steam boilers, make provision for *inferior* copper, used in their construction, by requiring an increased thickness. In those dated July 12, 1828, (Journal of the Franklin Institute, vol. viii. p. 403,) it is said, "If, however, the copper is not of *good quality*, one or two-tenths of the thickness given by the table should be added to the numbers thus found, for the thickness of the boiler." And again, vol. ix. page 40, "And as the tenacities of certain varieties (of copper) may be lower than this, it will be necessary, according to the quality of the copper, to increase the thickness given by the formula by about one or two-tenths of the thickness found."

The qualities of different kinds of copper, as of all other metals, vary considerably, while at the same time it is much more liable than others to be injured in its tenacity by slight excesses of temperature; hence it is of great importance in determining the thickness of the particular plates of which steam boilers are to be formed, first to ascertain their tenacity; this, indeed, is of special importance when different kinds of copper are used. It is understood that the copper of these boilers was not exclusively from one establishment.

But a previous knowledge of the strength of the plates of which a boiler is formed, does not afford *sufficient* security against its rupture: for although we may ascertain from its form and dimensions, and the tenacity of its plates, what degree of pressure it *ought* to sustain, yet this result affords no certain proof what pressure it actually *will* sustain. This discrepancy is owing not only to imperfections in, and different tenacities of, the plates, but also to our not knowing the relative *strength of the seams* where the plates are connected together. This is another reason why every boiler should be proved before being used. The explosion of these boilers is a serious call for legislative regulation on this subject. If further evidence had been required to show the utility of subjecting all steam boilers, used in transporting passengers, to a proof of at least double that of their maximum working pressure, and frequently to repeat this proof, such evidence is furnished by this explosion. It may be safely assumed that had such a law been in force, this calamity had not occurred, and that many explosions preceding this, would have been prevented. This would certainly have been true of the explosion on board of the *Ohio*, for the part ruptured in her boiler did not exceed, in some places, the thickness of paper at the time of the disaster; a circumstance which would unquestionably have been detected by a previous proof.

Mr. Potter, in his testimony in relation to the explosion of the boilers of the New England, says he usually carried from fourteen to seventeen inches of steam, and that the engine was intended to carry from sixteen to eighteen. The safety valve was regulated to blow off at eighteen. The steam, however, with the same weight on the valve, rose to twenty-four, and at the time of the explosion it seems to have been still higher.

These boilers, then, if proved at all, should have been tested with twice the pressure they were intended to carry, viz. twice eighteen pounds; but the result has shown what a perilous undertaking it would

have been to have proved them with twice the pressure of the lowest force mentioned by Mr. Potter, viz. fourteen, except by the water press.

By the English requisition, they would have been subjected to a proof triple their ordinary working pressure; and the thickness of the plates would have been required to be such, that their tenacity should not be injured by the proof. By the French ordinances, a quintuple proof would have been required, for although they allow a triple test for low pressure boilers, these would have been considered high pressure, and subjected to the proof accordingly. [Vol. viii. p. 33, Journal of the Franklin Institute.] It is obvious that had the boilers of the New England been required to undergo either of those proofs, the calamity by which seventeen citizens have perished, had not occurred, for the simple reason, that they could not have sustained the proof, and would consequently have been condemned.

It is true that Mr. Hall says they should have borne fifty pounds to the square inch, if there had been no previous imperfection. This is at least a remarkable assertion, and especially so, coming from an engineer, and given under oath. Whatever may be the facts or reasonings upon which it is predicated, it can scarcely be denied, that it is calculated to deceive the public on an important subject, and one which so frequently involves the loss of human life. Unless Mr. Hall can show a previous defect in the boilers, their rupture at thirty pounds (or probably less,) is a conclusive proof that he is greatly mistaken in his calculations. But while the maker of the boilers believes and testifies that they should have sustained fifty pounds to the square inch, what blame can reasonably be attached to one of his men, for using, while under his employment, little more than half that pressure?

There did not appear to me, after several examinations, any reason to believe the explosion was owing to a deficiency of water. If it had been, the horizontal flues would have shown the fact, but in these there was no sign of having been overheated. Had the temperature of the steam been at any time seriously increased from the same source, the covering of the steam pipes (carpeting) would have exhibited the proof; but this was perfectly sound on both pipes, and on every part of them.

No copper boiler, however good the quality of the metal may be, of the form and dimensions of those of the New England, should be permitted to use steam exceeding fifteen pounds to the square inch: while they continue to do so, they will exemplify, as they have hitherto done, the remarks of an intelligent writer, (vol. ix. p. 352 of this Journal,) who observes, "our boats are on the low pressure *plan*, but they carry from sixteen to twenty-five inches of steam, and this is nothing more nor less than high steam. The shape of our boilers is not calculated to resist such a pressure, and some tremendous accident will sooner or later occur, to spread ruin and death among the crowds who venture themselves within their reach."

Though, then, there is no conclusive reason to suppose that any serious deficiency of water took place in these boilers, there can be little

doubt that it was kept lower at the after ends, than at those in front, in consequence of the steam pipes having been connected with the boilers near the latter. By this arrangement a strong current was established towards the apertures of these pipes. The rush of the steam from the opposite ends of the boilers to escape through them, a distance of fifteen feet, would in some degree carry the water along with it, and thus have a tendency to leave those parts exposed. This effect we know is produced, more or less, by all openings, however small, as gauge cocks, &c.; but in these boilers it was still further increased, in consequence of the rapid consumption of steam by the engine, and the small proportional capacity of the boilers, they having had but twenty-four inches for steam and water room.

From the relative position of the gauge cocks, and the aperture of the steam pipes, in the boilers, it may be questioned whether the cocks could safely be depended on to show the level of the water, while the engine was in motion. The steam pipes of the New England were attached to the steam chimnies or to that part of the boilers embracing them, five feet from the roof of the boilers at their front end; being thus about six feet above the gauge cocks, which were placed almost directly under them. When the engine was in motion both steam and water would rush towards the opening of the steam pipes, and this effect would be greater immediately under those openings where the cocks were placed, than at distant parts of the boilers.

It may, I think, be safely assumed, that when gauge cocks are placed immediately (or nearly so) under the aperture of the steam pipes, they cease to indicate the true level of the fluid, while the engine is going; although they may do so, when it is at rest, and the safety valve closed.

Had cocks been placed on the after ends of these boilers, on the same level as those in front, I am satisfied that water would not have been found on the same level in both. Would not cocks so situated be an additional security in such boilers as those of the New England? and would it not be safer in all boilers, to have the steam pipes connected to them at the end opposite to that to which the gauge cocks are attached?

It is supposed that the rupture of these boilers *commenced* at the after end. Mr. Hall thinks, "in the arches near their connexion with the after end." If we suppose the boilers to have had, on an average, water at the second cock, viz. six inches above the flues, it is conceived, as very possible, to have been (when the engine was going,) as much lower at the after ends, in consequence, as before observed, of the rush of the steam to the front. These remarks, although not designed to establish the opinion above expressed, seem, nevertheless, to confirm it.

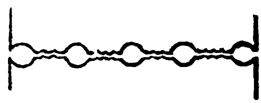
Whatever may be said in favour of "the water legs,"* in the construction of these boilers, it is conceived that they are more injurious than useful. Deposites of mud, &c. accumulate in them, which it is often difficult to remove; and, with great deference to the judgment of

* See report before referred to. This Journal vol. xiii. p. 130.

the Board of Examiners, it seems to me, that the thin sheet of water contained in them, and especially in the "middle legs," being imbedded in an intense fire, which in those last mentioned embraced both sides, the water was thereby expelled from them; not "being driven by the *steam* into the upper parts of the boiler," but by the repulsion of the heated metal.

These legs form a modification of the boilers described page 4, vol. x. of the Journal of the Institute, and the effects in both will be the same when thin surfaces are not heated uniformly. A further proof of this effect was lately mentioned to me by a friend from his own personal knowledge. Some years ago, two new boilers, similar to those above alluded to, were placed together on board the steam-boat "Legislator." The feeding pipe was attached to only one of them, a pipe being connected from it to the other; the draught of the furnace of the latter boiler was greater than that of the former, and the consequence was that the fire under it had to be damped, and sometimes taken out, in order to get the water into it.

Another circumstance which appears to be worth attending to in all explosions, is the commencement and direction of the rupture, and whether it be in the seams, or in the sheets. In many cases, the relative strength of the seams could thus be ascertained. In the examination of the boilers of the New England nothing satisfactory in these respects could be obtained, the place where the rupture commenced not being known, and the rents being in every imaginable direction. The seams were, however, in numerous instances separated in a line through the centre of the rivets, thus

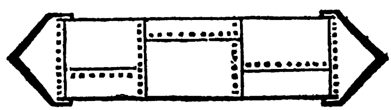


The joint where the vertical iron flue or chimney was connected to the horizontal flues, was separated chiefly in this manner, and in one place to the extent of three feet. Specimens No. 2 and 3, were from this joint. No. 5 and 7 from the body of the boiler, exhibit the same line of separation.

In the explosion of cylindrical boilers, and especially of those of which the ends are blown out, as the "Atlas," "Car of Commerce," Helen M'Gregor," &c. correct information on the line of separation would have been extremely valuable. The boilers of the above named boats had cast iron ends, when they were blown out. Was it the cast iron of the ends, or the wrought iron of the boilers, which gave way? Was the line of separation in the seam? through its centre, as above, or not? I have often regretted that the highly interesting accounts of Messrs. Halderman, Robinson, Benton, &c.,* did not give us more particulars on this part of the subject. Would it not, in such cases, be desirable to know also the thickness of the boilers at the seam, as well as that of the cast iron ends at the same place, in order to ascertain the comparative strength of each?

* See this Journal, vol. viii. p. 310, and vol. ix. p. 24.

It has been observed that the strength of cast iron ends can be increased indefinitely, but however true this may be with regard to them as separately considered, it does not appear equally so, when they are connected to a boiler. The interior force acting against the ends has a tendency to separate them from the body of the boiler, and the resistance opposed to this, is not so much the strength of the ends themselves, as of that portion of the body of the boiler to which they are united. Supposing them to be one hundred times stronger than the body, still their ability to withstand the pressure of the steam, would depend upon the cohesive force of that portion of the body of the boiler which is left between the rivets which united them to it. As there appears to exist a prejudice against cast iron ends, why not substitute wrought iron *conical* heads in their places? they could be made with greater facility than those of a hemispherical form which are used in Europe, and the metal would not be so much strained as in these latter, nor even as it is where plane ends to boilers are adopted.



In forming a working model of a boiler out of very thin copper, I adopted this figure for the ends, and I am not aware that they could have been made equally strong in any other shape. Had they been made hemispherically the metal would have been strained considerably, especially near the centre, in working it into that form.

Remarks on the Height of the Aurora Borealis, with a review of the accounts of some of the most remarkable Auroral Arches. By James P. Espy.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—In the Journal of the Franklin Institute for the month of November, 1833, I advanced an hypothesis on the Aurora Borealis, taking for granted that the observations of the Rev. Mr. Farquharson, of Franklin, and Hood, and Parry, and Biot, &c. had put it beyond all doubt that the aurora is formed in the region of the clouds. I find, however, by examining the report of the British Association for the Advancement of Science, to which you refer me in a note, that the author of the able report on meteorology, Mr. Forbes, considers the question of the height of the aurora yet unanswered, and, indeed, leans to the opinion of Mr. Dalton, that the aurora is one hundred miles high. As a doubt still remains on this subject, I propose to state the evidence in favour of Mr. Farquharson's opinion, in so plain a manner, that it will be impossible for any person, who examines the subject, to reject the conclusion that the aurora is in the region of the clouds. And as Mr. Dalton's name alone has great weight, and deservedly too, as he has done so much for meteor-

ology, I shall first examine the data from which he derives his conclusion, that "the aurora is about one hundred miles high."

The paper of Mr. Dalton which I propose to examine, is in the Transactions of the Royal Society for 1828. It is entitled, "On the height of the Aurora Borealis above the surface of the earth, particularly one seen on the 29th of March, 1826."

On this night, an arch of Auroral light was seen at various places from Edinburgh to Warrington and Manchester, one hundred and seventy miles south of Edinburgh, reaching from the horizon north of east to the horizon south of west at various altitudes.

Now, the grand mistake of Mr. Dalton is, that he takes it for granted, that it was one and the same arch which was seen at all these different places. That such was not the fact, will abundantly appear from the following considerations.

The arch was seen to move towards the south at every place of observation where motion was observed at all; at Edinburgh and Jedburgh 20° in fifteen minutes: and yet to many places south of Edinburgh, as at Jedburgh 48 miles, at Hawick 49½ miles, Keswick 90, and Lancaster 119, south of Edinburgh, the arch crossed the zenith before it did at Edinburgh, and, with the exception of Keswick, soonest of all at Lancaster, the most southern point. Kirkby Stephen, about 88 miles south of Edinburgh, and only three or four north of Kendal, in the direction of the arch, is the only place where the arch passed the zenith later than at Edinburgh. Now this proves that there must have been more than one arch; indeed, the one seen at Jedburgh could not have been the same as the one seen at Edinburgh, for at the same time that the Edinburgh arch was twenty-four or five degrees south of the zenith, the arch at Jedburgh appeared fifty degrees south of the zenith, which could not possibly be if there was but one arch. Mr. Dalton was aware of this, and supposed there must have been some mistake in the observations of these two places; but the observations of Jedburgh are confirmed by those of Hawick, which is very near Jedburgh, and as the stars through which the arch at Hawick passed are given, it is found by examining the celestial globe that they are very nearly correct.

As these two places are very near each other, there can be no doubt that the same arch was seen at both. I have therefore been particularly desirous to ascertain their exact position. Now according to several maps which I have examined for that purpose, I find that Jedburgh is something less than two miles, probably a mile and a half north of Hawick in the direction of the arch. I say the *direction*, meaning the general bearing; but I shall show that the bearings were very different, and even in these two places, only about two miles apart, the bearings were very different; the bearing of the arch in the eastern horizon, at Jedburgh, being the same as that at Hawick, and 23° further from the south in the west. Mr. Dalton makes Hawick north of Jedburgh, as it relates to the bearing of the arch; but both from the observations of the arch and from the examination of the maps, I am inclined to think that it is to the south of it. Now an arch must be very low—certainly not more than three or four miles high,

which has such different bearings at two places, not more than ten miles from each other.

If I rightly understand the account given by Mr. Dalton, the arch at Jedburgh at its greatest southern advancement was forty degrees from the horizon, and the one at Hawick was twenty-three degrees higher.

Now if we make no allowance for the bend in the arch, and if Jedburgh is actually about one mile and a half north of Hawick in the direction of the arch, the height of the arch will come out by calculation between three and four miles. We shall see how this height agrees with other facts, before the termination of this investigation.

Let us first examine what confidence is to be placed in the deduction Mr. Dalton draws from the observations at Whitehaven and Warrington, which were chosen, though, as it seems to me, more exceptionable than several others, as the elevation of the arch at Warrington depended on the mere opinion of the observer—the stars through which it passed at that place not having been marked at the time, which was done at several of the other places. For example, Hawick and Whitehaven—Hawick is a little more than thirty miles north of Whitehaven, in the direction of the arch. At 9 o'clock 8 minutes, I find by examining the stars through which it passed that at Whitehaven it was 24° south of the zenith, and at Hawick it was stationary at 8 o'clock 40 minutes, 37° south of the zenith—which, if it were the same arch, which it certainly was not, would give an elevation of about 55 miles. By proceeding in the same way, I find the observations at Hawick and Keswick make it about thirty-five miles high; at Jedburgh and Kirkby Stephen about forty; Edinburgh and Warrington, 150; Edinburgh and Whitehaven upwards of 500; Keswick and Lancaster, forty miles south of Keswick, make the arch at an infinite distance, for it was in the zenith at both places at eight o'clock; so, likewise, the distance will be more than infinite if we take the observations of Edinburgh and Keswick, Edinburgh and Kirkby Stephen, Edinburgh and Lancaster, and what is still more remarkable Kirkby Stephen and Lancaster; for though Lancaster is about eighteen miles further south than Kirkby Stephen, the arch was in the zenith there first by one hour, and more than a quarter of an hour before it reached the zenith at Edinburgh, a hundred and twenty miles north of it.

Now as all the arches moved south in all places where they have ever been seen to move, in any part of the world, we may infer with the greatest confidence, in connexion with all the other facts, that the arch seen at Kirkby Stephen was not the same as that seen at Lancaster, for it could not be, even if the arch was 100 miles high, unless it moved northward, of which we have no account. These two arches, then, observed at Kirkby Stephen and Lancaster, could not have been eighteen miles apart; how much nearer they were we cannot tell, unless we knew their velocity; and this cannot be ascertained by analogy, for the velocity of the different arches was not the same. The one at Edinburgh moved 20° in fifteen minutes, the one at Jedburgh and Hawick about the same, while the other at Whitehaven moved only from Castor to Pollux, about four degrees in twenty-three

minutes, and the one at Cockermouth remained nearly stationary though near the zenith during the very time that the Jedburgh arch moved from thirty to fifty degrees south. Now though Cockermouth is only about twenty miles south of Jedburgh in the direction of the arch, and yet, from the motion of the arches as seen at these two places, it is manifest, they were different arches. Besides, the arch at Cockermouth appeared more than half an hour before the Jedburgh arch, and was first seen 14° south of the zenith, twenty-five minutes before the Edinburgh arch had an existence, and continued to appear south of the zenith at the very moment when the Edinburgh arch appeared north of the zenith.

It being thus established that there were various arches, we may use the northern lights which appeared at various places near the horizon, to form a probable conclusion as to the height of these arches; for what appeared an arch at one place, must have appeared a northern light to an observer at a proper distance south of it. Now as we have no account of an arch having been seen between Edinburgh and Jedburgh, forty miles south, we have a right to infer, there was none, and this inference is confirmed by the fact, that at Jedburgh and Hawick no northern lights were seen, and from this fact we may infer that the Edinburgh arch could not have been eight miles high, for it would then have appeared ten degrees above the horizon at Jedburgh and Hawick.

Again, at Cockermouth, about thirty miles south of Jedburgh, a few streamers appeared *low* in the horizon; and at Whitehaven and Keswick, about five and eight miles south of Cockermouth, no northern lights were seen. Now, if we suppose that the arch at Jedburgh was the low northern light seen at Cockermouth, and not seen five miles further south, the conclusion forces itself upon us that the Jedburgh arch could not have been more than six miles high, for if it had it would have appeared ten degrees high at Whitehaven, where it did not appear at all.

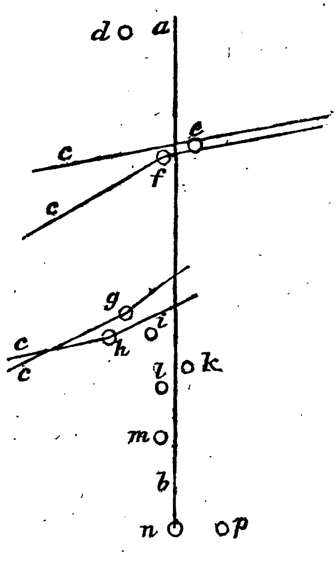
Again, a splendid northern light appeared at Kendal, about twenty miles south of the Whitehaven arch, though none appeared at Kirkby Stephen, eighteen miles to the east, in the direction of the arch, which renders it probable that the Whitehaven arch did not extend as far east as Kirkby Stephen. At Lancaster also, about twenty miles south of the Kendal arch, there was a luminous appearance along the northern horizon; and at Preston, about eighteen miles south of the Lancaster arch, an aurora was seen; but none was seen at Warrington, about thirty-eight miles south of the Lancaster arch. Something of the aurora was seen at Manchester and Doncaster, about fifteen and sixty miles to the east, and four and fourteen to the south, which was no doubt the arch seen at Warrington, sixty-one degrees high. Now it is impossible to conceive that an arch sixty-one degrees from the horizon at Warrington should not be seen at Manchester, only about four miles south, in the direction of the arch, if this arch was one hundred miles high; but if it was only three or four, it might appear an arch at Warrington, and a northern light at Manchester.

Unhappily, the elevation of the northern lights are not generally

given—none, with the exception of Manchester, which was about ten degrees; if we suppose, then, that it was the same light which was seen at Warrington and Manchester, of which there can remain no doubt, the height, by trigonometry, will be found to be less than two miles.

So if we suppose the aurora seen at Preston, eighteen miles south of Lancaster, to be the arch in the zenith of Lancaster, its height will be found about three miles.

Again, at Lancaster, where a luminous appearance was seen along the northern horizon; if we suppose this was the arch seen in the zenith at Kendal, twenty miles north, the arch will be found about three miles high, allowing the luminous appearance at Lancaster to have been seven or eight degrees high. Again, if we suppose "the splendid light in the northern horizon," seen at Kendal, to have been six or seven degrees high, and to have been the same as the Whitehaven arch, seen from fifteen to twenty degrees south of the zenith, the height of the arch will be from two to three miles. Once more, if we suppose the "few streamers seen *low* in the horizon" at Cockermouth, (too low to be seen at all at Whitehaven, only four miles to the south, at right angles to the arch,) to be the very arch which was seen thirty miles to the north of Jedburgh and Hawick, from thirty-seven to fifty degrees south of the zenith, the height of the arch will be about two and a half miles. The same inferences may be drawn as to the height of the arch from the very different bearings at different places, particularly the Jedburgh and Hawick arch, as mentioned before, and the Cockermouth and Whitehaven arch, as will appear by reference to the figure, in which the angles of these arches are carefully laid down by tracing out their directions among the fixed stars on the celestial globe, as they are copied from the original observers by Mr. Dalton.



a b, Meridian, 160 miles.
c c c c, Arches.
d, Edinburgh.
e, Jedburgh.
f, Hawick.
g Cockermouth.
h Whitehaven.
i Keswick.
k Kirkby Stephen.
l Kendal
m Lancaster.
n Warrington.
p Manchester.

It being, however, impossible to calculate the exact height from these bearings, as detailed, I will make no further observations upon them, than simply to say, that the great difference of the bearings at Jedburgh and Hawick alone cannot be accounted for on any supposition, but that the arch was less than five miles high. The correctness of this deduction will not be doubted, when it is recollected that the east and west bearings of all the arches, even those which moved farthest to the south, remained identically the same. For though, near the horizon, they changed their places as to the fixed stars, I have found that it was from the motion of the earth, and not from that of the arches; and this corresponds with all the phenomena of auroral arches which we have on record, as will appear more fully hereafter. The difference of bearing of these two places in the east is very little, while in the west it is twenty-six degrees, if no allowance is made for the difference of time when the observations were taken. But as the Jedburgh observations were made twenty-five minutes before those of Hawick, I find that the apparent motion of the stars will reduce this difference to twenty-one degrees, and actually cause the east bearing of Hawick, and the west bearing of Jedburgh, nine miles east of it, to coincide, while the two west bearings will differ twenty-one degrees. This remarkable fact demonstrates at once the great accuracy of the observers in their details, and the deduction aimed at in this investigation—the lowness of the arch.

I will now proceed to investigate Mr. Cavendish's auroral arch, as detailed in the Transactions of the Royal Society of London, for 1790.

On the 23d of February, 1784, a remarkable stream of light appeared at Cambridge, in England, from about 9 hrs. 5 mins. to 9 hrs. 25 mins., extending entirely across the hemisphere. It rose from the horizon, about ten degress south of west, near δ and γ Ceti; thence ascending in a straight line, inclined a little south to δ and ϵ Tauri, where it made an angle with its former course, and proceeded nearly in a vertical circle over β Aurigæ, ϑ Ursæ Majoris, by Cor. Caroli to Arcturus, setting in the horizon about twenty degrees north of east.

The light was steady, not undulating like aurora, and as it converged to the horizon at each end, had much the appearance that the tail of a comet would have if its nucleus was in the horizon. It was brighter and narrower near the horizon, and its greatest breadth in the zenith was about equal to the distance between the Pointers in Ursa Major.

At Kimbolton, about twenty miles W.N.W. of Cambridge, on the same evening, at 9 hrs. a similar arch appeared eleven degrees south of the zenith; extending from the W.S.W. horizon to the E.N.E.

At the very same moment when the Cambridge arch appeared in the zenith, one appeared at Kensington, about fifty miles south of Cambridge, twenty-four degrees south of the zenith, and continued visible more than twenty-five minutes longer than the Cambridge arch. Now nothing can be more certain than that the Cambridge arch which was seen in the zenith could not be the same as the Ken-

sington arch; for if it were, the latter arch would have appeared north of the zenith, instead of south.

There was an arch also on the same evening at Blockley, about eighty miles a little south of west from Cambridge, which at 8 hrs. 45 min. was fifteen degrees south of the zenith, and disappeared at 9 hrs. 5 min., about twelve minutes sooner than the Cambridge arch, allowing for the difference of longitudes.

These two places being so nearly in the direction of the arch, it is highly probable it was the same arch which was seen at both; and as the Cambridge Observer says that the arch rose from the horizon both in the west and east, and gives the stars beyond which it passed, which I find from the celestial globe are within eleven degrees of the horizon; and particularly as the arch was brightest there, we may safely suppose it was seen at Cambridge within four degrees of the horizon, after it had entirely disappeared at Blockley ten minutes. From this it may be demonstrated that the upper part of the arch could not have been five miles high; for if it had, it would have appeared at Blockley at least fourteen degrees high in the eastern horizon for ten or twelve minutes after it had ceased to be visible there.

It remains now to investigate the Kimbolton and Cambridge observations, to see what reliance may be put on the inference drawn from them by Mr. Cavendish that the arch was about seventy-one miles high. It is true that if a straight line passed horizontally through the zenith at Cambridge, with a bearing eighteen degrees south of west, at the same moment when it appeared eleven degrees south of the zenith at Kimbolton, this line would be seventy-one miles high; for it would pass 12.8 geographical miles from Kimbolton. But there are two circumstances not taken into account by Cavendish, both of which would go to diminish the estimated height of the arch; the bend in the arch as seen at Cambridge, and its motion southward, as mentioned at Blockley. The bend I find by consulting the stars through which the arch passed, was about thirty-five degrees high at Cambridge, forming an angle of twenty degrees with its former direction, and continuing straight in the new direction to the lowest point visible, which was shown before to be probably not more than four or five degrees. Now as the direction of the arch at Kimbolton is expressly stated to be straight from W.S.W. to E.N.E. we are compelled to infer that this bend was not seen at Kimbolton so as to attract notice; yet I find by calculation that if the arch was two and a half miles high, several miles of it must have been seen in common by the observers at Kimbolton and Cambridge. This conclusion is rendered almost certain, from the fact that at Kimbolton "the whole hemisphere was without a cloud."

If, however, we suppose the arch not much above a mile high, none of it would be seen in common by the observers at the two places, except a portion so near the horizon as not materially to affect the bearing at Kimbolton, and not likely to attract attention there.

Again, as the observation at Kimbolton was certainly taken before that at Cambridge, perhaps ten or twelve minutes, and as the motion of the arch was south, some allowance ought to be made for this, but

as the velocity of the arch is unknown, as likewise the exact length of time between the observations, it is impossible to know how much this allowance should be.

From the whole investigation of the Cavendish aurora, two conclusions are certain, that there were two arches seen on the evening of the 23d February, 1784, one at Kensington, and one at Cambridge, and that the arch at Cambridge could not have been two miles high.

[TO BE CONTINUED.]

Notice of a Steam Mill for Extracting Oil from Cotton Seed, at Natchez, Mississippi.

TO THE COMMITTEE ON PUBLICATIONS.

Gentlemen,—Observing that one of your correspondents urges upon those interested in the useful application of the large quantities of cotton seed which remain over and above that necessary for planting, the manufacture of oil from the material, and makes some suggestions for improving the processes hitherto employed, I have been induced to send you an extract from a letter containing a brief notice of a steam mill, for expressing the oil from cotton seed, located at Natchez, Mississippi.

Yours, &c.

B.

"The cotton seed is hulled by passing between large cylindrical rollers, resting upon beds of the same figure, into which the rollers fit; it is then bruised by two immense wheels which are dragged over the seed in a circular trough; these wheels do not turn on their axes as they are urged round the bed. After this process, the greasy mass is formed into cakes, and being transferred to holes adapted to receive them, the driving of a wedge into the holes by heavy stampers expresses the oil which is received in appropriate receptacles. The cake is now well dried, and being ground affords excellent food for cattle. The whole of the machinery is driven by steam, the fire to produce which is mainly furnished by the hulls of the cotton seed, being kindled with coal. A suspension rail-way connects the establishment with the landing on the bank of the river."

FRANKLIN INSTITUTE.

Monthly Conversation Meeting.

A Monthly Meeting of the Institute, for conversation, was held at the Hall of the Institute March 27th, 1834, when Mr. Tyler exhibited a ruling machine for ruling straight or waved lines, for plain and perspective ruling, and for medal ruling. This machine was explained and the methods of operating with it shown.

Specimens of the India rubber manufactured articles from the

Roxbury India Rubber Factory, were shown by Mr. George Woodman, of Boston, Massachusetts. The articles exhibited were a pair of ladies' shoes, water proof, a specimen of hose, and belts for machinery, of cloth saturated with the gum elastic, forming a tough and flexible article. The general steps in the manufacture were stated.

Jacob Keim, of Philadelphia, exhibited specimens of the hanging and reading astral lamps, invented by him. The wick is raised so high above the reservoir as to diminish very much the shadow cast by the lamp: the means of procuring this desirable effect are very simple and easily renewed, when, by use, they may have become ineffective.

Benjamin Slater, of Philadelphia, of the firm of Moore and Slater, submitted an ingenious and effective water wheel governor, invented by Nathan Scholfield, of Connecticut.

A transit instrument, made by W. J. Young, of Philadelphia, was explained by Sears C. Walker. The workmanship of this instrument was much commended, and the attempt, which will be followed up, pronounced decidedly successful.

Professor A. D. Bache showed a modification of the fantascope, or revolving disc, by which the mirror is dispensed with, and the distance between the disc and partition made variable to adapt it to near and far sighted persons. He also showed two specimens of the effects produced by the Dœdalum, a philosophic toy, on the same principle with that just referred to, invented and described by the English mathematician Horner. At the same time, the meteorascope of John J. Barker, of Philadelphia, was brought forward, and a method of using it without the mirror described by Prof. Bache, by which the instrument obviously anticipates the invention last exhibited.

REPORT OF THE COMMITTEE ON WEIGHTS AND MEASURES.

APPENDIX TO THE REPORT OF THE COMMITTEE OF THE FRANKLIN INSTITUTE ON WEIGHTS AND MEASURES.

Report of Dr. Samuel Moore on the authentication of the Troy Pound in possession of the Mint of the United States.

To the committee of the Franklin Institute charged with the subject of Weights and Measures.

Mint of the United States, October 1, 1833.

The standard troy pound of the mint is a copy, executed with great care, of the British parliamentary troy pound of 1758, recognised and designated in the year 1824 as the imperial troy pound of Great Britain. It was procured at my request, in 1827, through the attention and influence of Mr. Gallatin, Minister of the United States at London. By the friendly offices of Mr. Davies Gilbert, Vice President of the Royal Society, the standard troy pound in the care of the Clerk of the House of Commons, was, on the application of Mr. Gallatin to the Speaker of the House, committed to the charge of Capt.

Kater, for the purpose of effecting at his own house an adjustment of the copy to the original.

The standard weight is of brass, the original being of that material. It was made by Mr. Bate, who had constructed all the standard British weights, and the comparison with the original was made by a very delicate beam constructed by Robinson, the same artist who had constructed the beam with which Capt. Kater compared the standard weights above mentioned with the original standard troy pound.

The weight was enclosed in a neat casket carefully enveloped under seal of the American legation at London, and committed by Mr. Gallatin himself to the hands of Mr. Cucheval, a public messenger, bearing despatches from the legation to the United States, by whom it was delivered into my hands, accompanied by a packet containing ample certificates from Capt. Kater and Mr. Gallatin, testifying to the accuracy of the weight in question.

The casket and accompanying package were retained under seal, waiting the return of Mr. Adams, President of the U. S., from his family residence to Washington, in order that the seal of Mr. Gallatin, and the various facts of chief moment, in regard to the authentication of the weight, might be verified, on his authority. They were accordingly opened in the presence of Mr. Adams, in Philadelphia, on the 12th of October, 1827, and his full certificate in regard to the seal, which he readily recognised, and to the circumstances generally, giving assurance of the fidelity of the whole transaction, and the consequent accuracy of the weight, has been added to the vouchers in the case; he declaring, in conclusion, his entire belief, that the brass weight then exhibited was the identical copy of the imperial standard troy pound of Great Britain, intended and referred to in the aforesaid certificates.

The above facts having been communicated to Congress through the committee on the mint, the troy pound thus certified was specifically declared by law to be "the standard troy pound of the mint of the United States, according to which the coinage thereof shall be regulated." See section 2nd of the act of May 19, 1827, respecting the mint, a copy of which is hereto annexed.

This is the specific pound weight, assumed as the standard unit of the system of weights reported to the Senate of the United States, under a resolution of that body of 29th May, 1830—see a communication from Mr. Ingham, Secretary of the Treasury, made to the Senate March 3d, 1831; also the report of Mr. Hassler on the subject, 27th January, 1832, pages 10 and 25; and a communication to the Senate from Mr. M'Lane, Secretary of the Treasury, accompanying this report, dated 20th June, 1832. It has been constantly in my possession, and is preserved with the utmost care.

Very respectfully, gentlemen,

Your obedient servant,

Samuel Moore,

Director United States Mint.

Copy of the 2nd section of *An "Act to continue the Mint at the City of Philadelphia, and for other purposes."* Approved 19th May, 1828.

"Sect. 2. And be it further enacted, that, for the purpose of securing a due conformity in weight of the coins of the United States, to the provisions of the ninth section of the act passed the second of April, one thousand seven hundred and ninety-two, entitled 'An act establishing a Mint, and regulating the coins of the United States,' the brass troy pound weight, procured by the Minister of the United States, at London, in the year one thousand eight hundred and twenty-seven, for the use of the mint, and now in the custody of the director thereof, shall be the standard troy pound of the Mint of the United States, conformably to which the coinage thereof shall be regulated."

ACT REGULATING WEIGHTS AND MEASURES IN THE PROVINCE OF PENNSYLVANIA, A. D. 1700.*

An Act for regulating Weights and Measures. (*a*)

Be it enacted, That in each county of this province and territories there shall be had and obtained, within two years after the making of this law, at the charge of each county, to be paid out of the county levies, standards of brass, for weights and measures, according to the King's standards for the exchequer; which standards shall remain with such officer in the counties aforesaid, as shall be from time to time appointed by the Governor, with the advice of the Council: And every weight, according to its scantling, and every measure, as bushels, half-bushels, pecks, gallons, pottles, quarts and pints, shall be made just weights and measures, and marked by him that shall keep the standards. And that no person within this province and territories shall presume to buy or sell by any weights or measures, not sealed or marked in form aforesaid, and made just according to the standards aforesaid, by the officers in whose possession the standards remain, on penalty of forfeiting five shillings to the prosecutor, being convicted by one Justice of the Peace of the unjustness of his weights or measures. And that once a year at least, the said officer, with the Grand Jury, or the major part of

* Extracted from Bioren's edition of the Laws of Pennsylvania. Vols. 1 & 6.

(*a*) This act, except the last section, is confirmed post. chap. 138; and by an act passed on the 19th of January, 1733–34, (post. chap. 382,) millers, bolters and bakers were required to bring their weights and measures, once in three years, to the standard kept in each county, according to the direction of the law in the text: [but that act was repealed on the 5th April, 1781, (post. chap. 925.)

It appears by the records of the executive department, that the late Supreme Executive Council proposed two questions on this act for the opinion of the Attorney-General, (*Mr. Bradford.*) "1st. In whom the appointment of the officer therein mentioned is now vested? and 2d, Whether the Mayor or Cor-

them, and for want of the Grand Jury, with such as shall be allowed and appointed by the respective County Courts aforesaid for assistants, shall try the weights and measures in the counties aforesaid; and those weights and measures as are defective to be seized by the said officer and assistants: Which said officer, for his fees, for making each bushel, half-bushel and peck just measure, and marking the same that is large enough when brought to his hands, shall have ten-pence; and for every lesser measure, three-pence; for every yard, three-pence; for every hundred and half-hundred weight, being made just and marked, three-pence; for every lesser weight, one penny. And if the weights and measures be made just before they be brought to him, then to have but half the fees aforesaid for marking the same. And if the said officer shall refuse to do any thing that is enjoined by this law, for the fees appointed, and be duly convicted thereof, [he] shall forfeit five pounds, to the use of the Proprietary and Governor.*

II. *Provided always, and it is hereby enacted,* That the brass half-bushel, now in the town of Philadelphia, and a bushel and peck proportionable, and all lesser measures and weights coming from England, being duly sealed in London, or other measures agreeable therewith, shall be accounted and allowed to be good by the aforesaid officer, until the said standards shall be had and obtained.

III. *And be it further enacted,* That no person shall sell beer or ale by retail, but by beer measure, according to the standard of England. (*b*)

poration of Philadelphia have a right to appoint such an officer for the city, in exclusion of that appointed by the county?" The opinion of the Attorney-General, dated the 14th of October, 1790, in answer to the first question, states, "that previously to the revolution the power of appointment was clearly in the Governor; and, by the laws and constitution of the state, may now be exercised by *the President and Council:*" And, in answer to the second question, it states, "that the Mayor and Corporation have not any such power of appointment." However, as it seemed doubtful whether there is now in existence any such standards as are directed by the act to be procured, and as the original standard is now kept in a foreign kingdom, a revision of the act was suggested by the Governor to the Legislature, in his address of the 28th day of December, 1790, unless there should speedily be made by the Federal Government some general and permanent provision, which would supersede the necessity of any state regulations. As the constitution of the United States, (art. I. sect. 8,) vests in Congress the power of fixing the standard of weights and measures, and as a general regulation is contemplated by that body, the Legislature of Pennsylvania has not hitherto interposed on the subject. (*Note to former edition.*)

* The word [he] is not contained in the original roll, though inserted in the former edition. (*Note to former edition.*)

(*b*) By an act passed in 1705, (post. chap. 138) any person licensed to keep any tavern, inn, alehouse, or victualling house, shall sell beer and ale by wine measure to all persons who drink it in their houses, and by beer measure to all such persons as carry the same out of their houses, under the penalty of ten shillings, &c. and this act is confirmed, except the third section.

An Act for selling beer and ale by wine-measure.

Whereas by a law of this province, for regulating the dimensions of casks, &c. it is enacted, among other things, That a barrel shall contain thirty-one gallons wine-measure. And whereas by another law of this province, for regulating of weights and measures, it is, amongst other things, enacted, That none shall sell beer or ale by retail, but by beer-measure, according to the standard of England; by reason whereof the retailers of beer and ale are obliged to sell the same by far greater measure than they buy it: For remedy whereof, *Be it enacted,* That from and after the publication of this act, all persons which now are, or which at any time or times hereafter shall be licensed to keep any tavern, inn, ale-house or victualling-house, within this province, shall sell beer and ale by wine-measure to all persons as drink it in their houses, and by beer-measure to all such persons as carry the same out of their houses, under the penalty of ten shillings, to the use of the poor for every county where the offence is committed, any law, custom or usage, to the contrary in any wise notwithstanding.

II. *Provided always, and be it further enacted,* That the above recited law, entitled, *An act for regulating weights and measures,* and every part and proviso therein contained, except the last clause thereof, relating to selling beer and ale by beer-measure, shall be and remain in full force, any thing herein contained to the contrary notwithstanding.

Passed in 1705.—Recorded A. vol. I. page 184.

See ante. (chap. 73,) pa. 19. The act for regulating the dimensions of casks, &c. herein recited, was repealed March 20th, 1810.

A supplement to the act, entitled "An act for regulating Weights and Measures."

Sect. 1. Be it enacted by the Senate and House of Representatives of the commonwealth of Pennsylvania, in general assembly met, and it is hereby enacted by the authority of the same, That if any person or persons shall counterfeit the brands and marks, or either of them, of the sealer of measures in the city and county of Philadelphia, or shall presume to buy or sell by any measure, not sealed, branded or marked, according to the directions of the act to which this is a supplement, or shall alter the size of any vessel with a fraudulent intent, after being sealed, branded or marked by the proper officer, he, she or they, being thereof legally convicted, shall forfeit and pay any sum not exceeding thirty dollars, one half thereof to be paid to the informer, and the other half to the commonwealth.

Sect. 2. And be it further enacted by the authority aforesaid, That if any person or persons shall, within the city and county

aforesaid, presume to sell or offer for sale any dry measure whatever, not sealed, impressed or branded by the sealer of measures, according to law, he, she or they, upon conviction thereof, shall forfeit and pay any sum not exceeding ten dollars, to be appropriated as aforesaid.

Sect. 3. And be it further enacted by the authority aforesaid, That if the said person who may be appointed sealer aforesaid, shall at any time stamp or seal any measure that does not agree with the standard now in force, and being duly convicted thereof, shall forfeit and pay any sum not exceeding ten dollars to the guardians of the poor of the proper ward, township or district, for the support of the poor thereof: or shall refuse or neglect to do any thing enjoined on him, in and by an act, passed in one thousand seven hundred, entitled, "An act for regulating weights and measures," or charge more fees than is directed by said act, and being duly convicted thereof, he shall forfeit and pay any sum not exceeding fifty dollars, one half to the informer, the other for the use of this commonwealth.

Sect. 4. And be it further enacted by the authority aforesaid, That all proceedings for the recovery of penalties incurred in pursuance of this act, shall be proceeded in, and recovered before any alderman or justice of the peace of the proper ward, township, or district, in the same manner, and be subject to like appeal, as debts of the same amount are now recoverable.

Sect. 5. And be it further enacted by the authority aforesaid, That so much of the act to which this is a supplement, as is hereby altered or supplied, is hereby repealed.

Passed 29th March, 1813—Recorded in Law Book No. XIV. p. 105.

Note.*—Grain usually bought and sold by measure to be regulated according to the following standard, viz. the weight of a bushel of wheat to be 60, of rye or corn 58, of barley 47, of buckwheat 48, and of oats 32 pounds.

Foreign salt to be bought and sold by weight per bushel, viz. coarse salt 85, grained salt 70, and fine salt 62 pounds. Nothing in the act to prevent selling or buying by measure, (ch. 4547.)

The bushels for measuring lime in the city and county of Philadelphia, Bucks, Montgomery, Delaware, Chester, Lancaster and York, to be 13½ inches diameter at the bottom, and 15 at the top, and 13 inches and 47-100 perpendicular depth in the clear. The Court of C. P. to appoint persons to procure a brand and make every bushel; his qualifications and duties. Penalty of 5 dollars imposed for using a bushel not stamped, (ch. 4718.)

See vol. 1, p. 18, and notes thereto.

Report in relation to the practice in the sale of Grain, Salt, &c.

The committee appointed to inquire into the practice of selling Grain, Salt, &c. in the city of Philadelphia, and to examine such

* The information contained in this note, renders it unnecessary to reprint the acts referred to. The duties of the sealer and regulator form no part of the subject under consideration by the committee.

of the details of the bill reported to the House of Representatives, as relates to this point, beg leave to state:

That from the best information they are able to obtain, the existing usages, founded on commercial practice, appear to be as follows: Wheat is universally bought and sold by weight, sixty pounds being estimated to be equal to a bushel. Barley is bought by the brewers of Philadelphia, at the rate of forty-eight pounds per bushel. Rye, indian corn, buckwheat and oats are bought and sold by the measured bushel. Salt of all descriptions pays duty at the rate of fifty-six pounds to the bushel, and is in all cases sold by measure. Anthracite coal is sold by weight, twenty-two hundred and forty pounds being allowed for one ton. Bituminous coal is sold by measure, a vessel containing ten pecks being used as a measure, and called two bushels. Beer is sold by the wine gallon of 231 cubical inches, and no other gallon appears to be known in the commerce of Philadelphia for the measurement of liquids, unless the measure used in the sale of milk be an exception, this being stated to be one founded on the standard dry bushel.

The details of the bill, so far as they attempt to define quantities of commodities, ascertained by weight, which shall be deemed and taken to be equal to quantities ascertained by measure, appears to the committee to be obnoxious to objection in every point of view: first, in attempting to make things the same by law, which nature has decreed shall be otherwise; for grain obtained from different soils, and salt manufactured by different processes, will be found to differ in their specific weight, as sensibly as lead and silver differ from each other; and however convenient an assumed weight may be, as a measure of its value in commerce, its introduction into a bill fixing standards of weights and measures, tends, in the opinion of the committee, rather to unsettle than to establish. Secondly, if it be intended to fix by the bill in question the quantities of commodities which shall be taken and allowed to correspond with the standards, it would seem necessary to detail all the articles which are the subject of commerce, and to provide as well for a hogshead of wine as of cider, or for the measurement of sand equally with that of lime, or for lumber as well as wood for fuel.

Your committee would respectfully recommend, that all attempts to regulate the quantities of commodities, which shall be deemed and taken to be equal to the said standards, shall be abandoned, and the regulation of such matters left to the argus eyes of Commerce; or, when necessary, to the execution of the Inspection laws, in which the requisite provisions might be incorporated.

FREDK. FRALEY, } Committee.
S. C. WALKER, }

To the Committee on Weights and Measures.

Philadelphia, Jan. 16, 1834.

Report in relation to the Standards of Weights and Measures in the city of Philadelphia.

The committee appointed to examine the standards of weight and of measure in the possession of the regulator and inspector of weights and measures, and of the sealer of dry measures, in the city of Philadelphia, report:

That the standard of measure is a steel yard rounded at the ends by use, and marked with submultiples of the yard by notches, about one thirty-second of an inch in width. This standard is *supposed* to have been brought to the city by William Penn.

The capacity measures in possession of the regulator, as far as liquid measures are concerned, cannot be called standards, they are of sheet copper and much battered; the measures purport to be a gallon and half gallon, date and origin not known. The standard in actual use is a prismatic tin cup, made under the direction of the present regulator, and intended to be one-fourth of the gallon of 231 cubic inches.

The dry measure standards in this office are two, a pint and a quart, made of cast brass, and stamped WR The stamp is also upon them.

The standard weights are one of 2 lbs., one of 4 lbs., of 7 lbs., 14 lbs., 28 lbs., and 56 lbs. There are various marks upon them, of which the city of Philadelphia mark is common to all, as well as the mark . The mark A is also common to them all, and is presumed to have been a private mark of inspection. The 4 lbs. weight is distinctly marked G; on the 2 lbs. and 28 lbs. the letter is partly obliterated, and may be either G or C; on the 56 lbs. it appears to be C seeming to indicate that the standards have not a common origin. All the weights are *leaded* below. A copy of the 2 lbs. weight, tested at the mint, weighed exactly 14,000 grs. troy, the number of grains in 2 lbs. avoirdupois; a circumstance, which, considering the changes to which the standards have been liable, and the rude means furnished to the regulator for their adjustment, must be considered accidental.

It is due to the regulator, Mr. W. B. Mott, to state that every information was furnished to the committee which was in his possession, and that he appears to have made the most of the means furnished him by the city or state, for carrying into effect the duties of his office.

The standards of dry measures in possession of Mr. Barger, sealer of dry measures, are a copper half bushel, and a bell

metal half peck and quarter peck; the rim of the first named measure is much worn and apparently has been often repaired.

The committee conclude that the city standards are, though traced by legend to Wm. Penn, of different dates and of uncertain origin and authenticity, and that they have been deteriorated by use, and by regulation at different times, since they have been in use as standards.

Respectfully submitted.

ALEX. DALLAS BACHE,
SAML. V. MERRICK,
Jan. 8, 1834. SAML. MOORE.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN NOVEMBER, 1833.

With Remarks and Exemplifications, by the Editor.

(Continued from page 276.)

21. For *Lubricating the Pistons, Piston Rods, &c., and improvements in other parts of Steam Engines;* Samuel Hall, Bassford, Nottingham county, Great Britain. Granted in pursuance of a special act of Congress, passed March 2nd, 1833. November 19.

(See description among specifications.)

22. *For Preparing Blood to be used for Refining Sugar, and clarifying other articles;* Thomas Hewitt, city of Philadelphia, November 19.

The blood is to be stirred and mixed with animal or vegetable charcoal, about pound for pound. The mixture is then to be submitted to a gentle heat, either natural or artificial, not, however, such as would coagulate it, but only sufficient to drive off the moisture and "Mephitic effluvia." When dry, it is to be reduced to powder by means of a mill, or otherwise.

When this powder is required for use it is to be so far dissolved in water as to have the consistency of thick cream, and then is to be employed as blood is generally used in the refining of sugar.

The claim is to the preparing of blood, *before drying*, by mixing it with animal or vegetable charcoal.

The article intended to be clarified is not blood, but the serum of blood, after the clot, or fibrin, has been separated from it.

There is one part of the patent law which it is not always convenient, or possible, to execute; it is that which requires that specimens of the ingredients used in the thing patented should be deposited when the patent is taken for a *composition of matter*. Bullock's blood could not be very well kept in the patent office; and should any one obtain a patent for a new mode of preparing and mixing "*poudrette*," specimens of the ingredients would not be desirable.

23. For *Laying the timber work of Rail-roads;* Elisha Johnson, Rochester, Monroe county, New York, November 19.

This patent is for a rail-road, in the construction of which there are to be sleepers of round timber, hewed on one side, or prepared in any other way; they are to be connected by cross timbers three feet apart, upon which are to be placed wooden rails of yellow pine; and iron plates, two by four inches, are to be spiked on to them.

The improvement is said to consist in the form, which combines cheapness of material with simplicity of construction, and increase of strength. Some further advantages are also named, but we are unable to perceive in what way this plan is to secure them, or in what part its novelty is to be found.

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24. For a *Cooking and House Warming Apparatus;* Richard Johnson, Baltimore, November 19.

This contrivance is denominated "The Cook's Relief, and Fuel Saver." We are told how the apparatus is to be formed, but are left to conjecture in what the invention of the patentee consists, and as the business of a critic upon patented machines is not one of a very imaginative character, we "give up" the task of conjecturing to those more practiced than ourselves in the art of guessing.

The fuel is contained in a grate below, which appears to have an open fireplace. Above this is a grating upon which to set boilers, and just above the grating there is an opening in the back plate to serve as a flue. Next comes a plate, or shelf, upon which heavy joints are to be roasted in suitable dishes, and another shelf surmounts this, for roasting, or baking lighter articles. All these shelves are enclosed in an iron oven, or closet, with folding doors, which oven, we are told, may be built into a fireplace, and take no room. An iron tube may cross the fire, and heated air may, if it will, convey heat to the other apartments; and thus endeth the whole history.

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25. For a *Machine for Spinning Tobacco;* Ashton Johnson, Assignee of James Martin, Petersburg, Virginia, November 19.

The claim in this case is to "that arrangement of the kind of spinning apparatus which is commonly used in factories for spinning cotton, wool, and other fibrous materials into thread, whereby it is fitted and applied to the spinning and winding of tobacco upon the spool, as described and represented; and which is distinguished from the ordinary mode of spinning tobacco as entirely as the spinning of yarn upon the vertical spindle, with flyers, is distinguished from common hand spinning upon what is called the big wheel, in which the opera tor has first to spin the article, and then to lay it upon the spool or spindle."

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26. For a *Machine for Cutting Spun Tobacco;* Ashton Johnson, Assignee of James Martin, Petersburg, Virginia, November 19.

The spun tobacco passes between fluted rollers, which, in turning,

draw it on, and pass it through a short tube; a knife is made to vibrate against the end of this tube, for the purpose of cutting the tobacco into lengths; by varying the size of the pulley around which the band passes in order to vibrate the knife, the lengths into which the spun tobacco is cut, are also varied. The machine is simple, and well adapted to the intended purpose. The claim is to "the general arrangement and operation of the several parts, for the cutting of spun tobacco into determinate lengths."

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27. For a machine for *Cutting Vegetables for Fodder;* William A. Hamilton, Albany, Albany county, New York, November 19.

This machine consists of a cylinder of cast iron, which may be ten inches in diameter, and a foot in length. Two knives pass from end to end of it, on opposite sides, and to such distance from it as shall be equal to the length, or thickness, of the pieces into which the articles are to be cut; for ease of cutting, these knives are placed diagonally. The cylinder is to be turned by a crank, and has a fly wheel on its shaft. Above the cylinder is placed a box, which is to serve as a hopper to receive the roots, straw, or other articles to be cut. This box is rectangular, of a width equal to the length of the cylinder; it has a fixed knife on its lower end, adapted to those on the cylinder; a door closes upon the articles placed in it, and a follower, of such weight as may be necessary, is placed within the box, at the upper end of it, to press down the contained materials; the bar does not stand vertically over the cylinder, but is inclined from the perpendicular.

The amplified description of this apparatus covers about eight pages of manuscript, and although its individual parts are set forth in their due dimensions, with all legal precision, it fails in the most important point, that of telling us what the patentee has invented, or, in the words of the law, "distinguishing the same from all other things before known or used."

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28. For an improvement in the *Mode of making Hoes;* George Harper, Montgomery county, Pennsylvania, November 19.

The specification of this patent is a brief affair, as the whole invention consists in cutting a steel plate, or one of iron and steel, into the proper shape, punching two holes through it, where the handle is to be placed; riveting two straps into these holes, placing the handle between them; and then riveting through the whole, as a spade handle is riveted.

There are several patents for modes of attaching the handles of hoes to steel plates, and although this is the last of the series, it certainly is not the best.

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29. For a *Machine for Making Shingles, Staves, Heading, Siding, and Laths;* Richard Hunt, Carrol, Chataque county, New York, November 19.

There is a general likeness between this machine and some others for the same purpose, but the claim made refers to the particular mode in which the operations are performed by it.

"The riving of the shingles, laths, siding, and staves, in the manner described, and the shaving at one stroke of the machine, a perfect shingle, in the following manner:—The shingle, after being rived, is placed on the plank, moving on the inclined plane, confined at one end by the slip gauge, which moves back and forth with the carriage passing over the shingle, and the knives following immediately after the roller, one shaving passing down through the plank, the other over the roller, and the shingle passing out at the tale of the machine, is claimed as new, and of my own invention."

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30. For a *Washing Machine;* Andrew Glendening, Franklin county, Indiana, November 19.

This is called "the universal band washing machine." The description of it is obscure, the drawing imperfect, and the claim a nullity. We gather from it, however, that a water tight box is to be made, five feet in height, three feet three inches wide, and two feet eight inches deep. In the upper end of this box is to be placed a roller of three feet in length, and two in diameter; another, of four inches diameter is to be placed beneath it, within four inches of the bottom of the box; and the other rollers are to occupy intermediate stations. Three bands, or endless aprons, each in width equal to one-third of the length of the cylinder, are to be passed round them; or, in place of them, one single wide band, or endless apron, may be employed. The clothes to be washed are to be attached by suitable strings to these endless aprons, or bands, and the whole made to revolve. Soap-suds cover a few inches of the bottom of the box, and into this the clothes dip, and are squeezed between the bands and the rollers, the latter leading the former in a tortuous course.

This, we believe, is a fair description; and if so, we apprehend that there will be a dangerous interference of garments as they pass by each other, and that in their rencounter such fearful rents will often be made as to render it necessary to place them in the hands of the surgeon, ycleped a seamstress, to sow up their wounds.

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31. For a machine for *Exterminating Bed Bugs by Steam;* Thomas Miller, Newburgh, Orange county, New York, November 19.

We described a patent apparatus for this purpose in a former volume, and there remarked that the contrivance was a mere copy of one which had been described and figured in the London Mechanics' Magazine, and other English journals.

The machine consists, essentially, of a chafing dish, or furnace, with a boiler above it, from the spout of which steam is to be projected into the crevices containing the vermin. The present patentee has come forward in a style which indicates that he considers the whole affair as new. The only superior merit exhibited in the appa-

ratus as described by him, is its being made much more complex than that originally proposed; it is, in fact, quite a steam engine, with a steam tube, steam chamber, stop cocks, &c. &c. No part of the contrivance, however, is claimed as new, and from what we have already said, it may be inferred that we do not think it *altogether* so.

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32. For a *Mortising Machine;* Henry Mellish, Drewsville, Cheshire county, New Hampshire, November 19.

There have been so many machines for mortising, made the subject of patents, that from this circumstance, and the simple nature of the operation to be performed, we are not justified in looking after any great novelty in those which are now brought forward. Some difference in the arrangement of the respective parts is all that can be reasonably expected. There are in the present machine two chisels placed side by side, and worked up and down by a double crank, the shaft of which is turned by a band and pulley. The carriage upon which the stuff to be mortised is placed, is moved backward and forward by a rack and pinion, and is operated upon by the movement of the machine. The large wheel to which the power is applied, carries a mandril with a bit to bore the stuff, preparatory to mortising.

The claim is to the "machine taken as a whole; or the combination of the several parts, but particularly the two chisels having shoulders for driving out the chips, working alternately on a double crank.

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33. For a *Tenoning Machine;* Henry Mellish, Drewsville, Cheshire county, New Hampshire, November 19.

Two iron wheels, or disks, are fixed upon a vertical shaft, made to revolve by a band passing round a pulley; the iron disks are placed at a distance from each other exceeding that of the thickness of the tenon to be cut. Upon the peripheries of the wheels are placed chisels or cutters; and the pieces of timber to be tenoned are secured, by proper contrivances, upon a sliding carriage, so that the stuff can be brought up against the revolving cutters, which leave the tenon of the right thickness, and properly shouldered, when it has passed through the revolving disks.

There is no claim made; and this ought not to have been omitted, for although there appears to be sufficient novelty in the particular mode of cutting the tenons, the same may not be the case with all the other parts of the machine.

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34. For an improved *Machine for making cotton roving;* Lucilius H. Moseley, Lisbon, New London county, Connecticut, November 19.

This machine for making cotton roving, or roping, is in many of its parts similar to those already in use for the same purpose. The parts claimed as new are "the general combination of that part of the apparatus by which the condensing is effected; the reciprocating roller and revolving apron used, not being claimed singly and separately, they having been previously used, but only the particular

manner in which they are arranged and combined; by which mode of arrangement the desired end is most perfectly obtained, which had not been accomplished by any of the arrangements heretofore made. The single geared cone is also claimed as constructed, and connected with the other parts of the machinery, upon the principle, or in the manner set forth; this single geared cone being applicable, and intended to be applied to, other machinery used in the manufacture of textile substances."

The particular arrangements referred to cannot well be explained without the drawings; a tolerable idea, however, may be formed of that part called the geared cone, from the description, which is as follows: "This geared cone consists of any number of toothed wheels, say seven or eight, gradually increasing in size so as to give them, when combined, a conical appearance. They are connected together, but slide upon their shaft, by means of a feather, which allows them so to do, but causes them to revolve with the shaft. The wheels which constitute this cone are thrown alternately into gear with the machinery which produces the traversing motion of the carriage, and the winding of the condensed roping upon the spools. The cone, as thus constructed, is a great improvement upon those before used, which were double, in order to their producing the effect intended. The sliding of the geared cone upon its shaft, which is essential to it as a single cone, obviates the necessity of much gearing, and among its many other advantages, possesses that of being very easily shifted."

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35. For a *Machine for Cutting Straw;* William Mitchell, Anderson District, South Carolina, November 19.

A straw cutting machine operating in the same way with this, only better arranged, has been in use for half a century; should the patent now taken not be sustainable on the score of novelty, extensive and long tried utility may at all events be pleaded in its favour. A heavy wheel is to be made to revolve vertically, and is to carry knives, or cutters, extending from its centre to its periphery, and the straw to be cut is fed up to the knives in a horizontal trough.

In all the cyclopedias, encyclopedias, and works on agriculture which have appeared during the last age, there are representations of M'Dougal's machines for cutting straw, operating on the foregoing principle; and if that before us is an improvement, this term must be employed under a very different acceptation to that which we have been in the habit of ascribing to it.

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36. For a *Truss for Hernia;* John Morris, Derby, New Haven county, Connecticut, November 19.

The spring of this truss is to be made of round, brass wire, which may be about one fourth of an inch in diameter. The middle part, which is to come against the side of the body, is to be flattened by hammering, and may be covered with any suitable material. This spring is to be bent round in the usual form. There are to be two

pads, which it is proposed to make of leather, joining two thicknesses together, and rounding the edges neatly. A brass plate nearly the size of the pad is to be placed on the outside of it, and in the middle of this there is to be a knob, with a hole drilled through to receive the ends of the spring. The shank of this knob passes through the leather pad, and is riveted to a small brass plate on the inside. The wire spring is to have a hole of about $\frac{1}{16}$ inch drilled through within $\frac{1}{4}$ inch of each end, and another about $1\frac{1}{4}$ inch within it. When the pads are put into their places, a wire staple, forming a semicircle, is to be bent and riveted into these holes; thus allowing free play to the pad. These staples lie in the planes of the pads, the bow being upwards when the truss is on the body.

The claim is to "the use of the materials of which it is composed, for this purpose; and such a construction and arrangement of the parts as secures in the most natural and easy manner the needful horizontal or sliding and revolving motions of the parts, self-adjusting to the various motions of the body, without the incumbrance of springs or any other means."

The advantages named are the facility with which the spring may be bent by the wearer so as to fit the body; it being less acted upon by moisture than is iron or steel; the cleanliness of the leather pad, and the facility with which it may have any covering placed over it.

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37. For a *Forcing Pump;* Benjamin Saphan, Waterford, Saratoga county, New York, November 19.

Although the principle upon which this pump operates is old, there is an arrangement of the parts sufficiently new upon which to found a claim for a patent. The principle is the same with that of the *pompe des Prêtres*, first, we believe, used in the *Jardin des plantes*, in Paris, at least a century ago; and described in some of the books as a "pump without friction," for although it is not absolutely so, the ordinary friction of the piston is entirely dispensed with; a diaphragm of leather crossing the chamber, being made to perform the office of the piston. This pump is described in "Nicholson's Operative Mechanic."

In the pump, which is the subject of this patent, the leather diaphragm is used, and is made to act so as to convert the instrument into a double forcing pump. The body of the pump is made in two parts, each of which will bear a resemblance to a common wash hand bowl, with its projecting rim, representing the flanches by which the two parts may be bolted together. When they are attached to each other, a piece of leather crossing the body of the pump is enclosed between the flanches, and is left bagging in the inside, so that it may play from side to side. The piston rod passes through a stuffing box in the centre of one of the halves of the body, and is secured to the centre of the leather diaphragm; and a lever at the outer end, acting like a pump handle, will serve to work it backwards and forwards. The leather is stiffened by pieces of metal so placed as to render its vibratory action efficient.

Projecting from opposite edges of the body, there are short tubes,

or necks, to which to attach the pipes for the supply and discharge of water; one half of each of these necks being cast with each half of the body. Two semicircular valves are contained in these necks; those belonging to the supply tube opening inwards, and those to the discharge tube, outwards.

This description will render the general arrangement manifest to those acquainted with hydraulics, and will, to them, point out the difference between this pump and those on a similar principle which have preceded it. The patentee observes that, "as the altitudes or positions in which this pump may be placed, and the modes in which the lever or handle may be applied are various, it is unnecessary to specify any one in particular." The claim is to "the double chamber and leather partition piston, supported by plates of metal as above specified, as essential parts of this improvement."

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38. For an improvement in the *Running of Mill Stones;* Reuben Kendall, Wilkes county, Georgia, November 19.

The improvements described in the specification of this patent do not appear to be of a very important character, nor is their general utility obvious; in addition to this, the patentee has not designated them, but has merely told us how he makes his spindle, his drivers, his bridge tree, &c.; mixing together, without discrimination, the new and the old.

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39. For *Cutting out, or Draughting Gentlemen's Garments;* Benjamin J. Lewis, Mount Vernon, Knox county, Ohio, November 19.

After describing "the delineator" with its scale of divisions; "the protractor," and a considerable number of "diagrams," representing the individual pieces which in their aggregate state are to form a garment, through six well filled pages, the patentee "claims to be the inventor and discoverer of the protractor; also the manner of drafting by all the diagrams attached to the instrument, except the diagram of the frock coat skirt; also the addition of the thirty seconds to the scale of divisions; and also the form of the *instrument;* as well as the combination of numbers calculated for height and waist."

Were we to form a judgment from the practice of our own little tailor, we should be led to conclude that the multiplication of *mathematical scales, protractors, delineators, squares,* and other instruments intended to render judgment and practice unnecessary in the art and mystery of cutting garments, had made it difficult to choose among them, and thus tended to cause them all to be laid upon the shelf. For five or six years past, whenever a new coat was to be made by our professor of cutting, the requisite dimensions have been taken by different instruments, some of them quite formidable, if not terrific, in appearance; we recollect one very much like a gibbet, and others resembling sundry instruments of torture; but the same apparatus was seldom, if ever, used a second time; and a few days since, having ourselves to undergo a similar operation, nothing was applied but a

simple tape, divided into inches; and yet the coat, to the uninitiated, at least, appears to set as well as those which were mathematically elaborated. This does not look well for the development of genius.

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40. For an improvement in the *saw mill;* Nathan Kirk, Frankfort, Clinton County, Indiana, November 19.

The improvements stated to have been made consist in so arranging the machinery of a saw mill, that after a log has been slabbed, and fixed upon the carriage, it shall be sawed completely up, to timber of any gauge, without manual assistance; the raising of the feed hand, the running back of the carriage, the shifting of the head and tail blocks, and all the other changes required, taking place in regular succession.

The description is too brief, the drawings are too imperfect, and the references to them too few, to enable us to form a correct judgment respecting the machinery, nor is any part of it specifically claimed.

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41. For a *Self Sharpening Horizontal Plough;* Cyrus N. M'Cormick, Rockbridge county, Virginia, November 19.

There are certain shifting parts to this plough, to adapt it to hill side ploughing, and the things claimed consist in "the peculiar arrangements and construction of the several parts of the plough, and particularly the mode of forming the point at the end of the mould board, on which the share turns, and the two braces with the space between them, in which the neck of the share works; the brace near the neck of the mould board; the two projections on which the mould board slides; and the share, with the mode of turning it by the latch rod."

Should the security of this patent depend upon the mode of constructing certain braces, and the exact manner of conducting certain motions, we fear that it is not quite safe, being apprehensive that it would require no great share of ingenuity to avoid, or evade, the operation of a right so founded; dependence may be more securely placed on the *general*, than on the "*peculiar* arrangement and construction of the several parts."

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42. For an improvement in *Axes and Edge Tools;* John F. Mackie, City of New York, November 19.

From the description given, it would appear that this, so called, improvement, cannot be applied to edge tools generally, but must belong exclusively to axes, or other cutting instruments equally massive.

The head, or pole, of the axe, containing the eye, is to be in one piece, and the cutting part, or edge, in another, the latter division, judging from the drawing, being equal to about two-fifths of the length of the instrument. The two parts are to have projections and openings adapted to each other, like the joints of a butt hinge, or the teeth of a wheel; and when placed together they are to be retained

by passing pins, or rods, through openings drilled in the joints, across the axe. The claim is to "the axe being made in *two* parts, with the alterable bit, or cutter, which may be removed and replaced at pleasure; also the mode of fastening, but not confined exclusively to the methods named."

The benefits which it is supposed will result from this manner of constructing axes, are said to be many, a few of which are given by way of example; of them we shall mention two or three only. By having a number of shifting edges, one axe will serve for cutting, and splitting, by merely changing the edges. By taking extra cutters, the necessity for grinding, whilst at work, is obviated, and accident by breaking readily repaired. When the article is to be transported, five dozen of cutters will not occupy more room than one dozen of axes, &c. &c.

The preceding may be called the profit part of the account, but, if a just estimate is to be made, it must not be taken alone. We do not expect to find the opposite, or loss, side, in a specification, but it is our business in endeavouring to strike a balance, to look after it, although it may have been overlooked by others. We apprehend that the objections would be, at least, as many as the enumerated advantages, but, as in the former case, we will give but two or three. When an axe is used to cut, the solidity of its parts is essential to its efficiency; but where pieces are to slip out readily, to be exchanged, and pinned into their places, this solidity must be sacrificed. The strength also depends upon the continuity of its parts, and we feel assured, therefore, that the readiness with which a broken cutter may be replaced by a whole one, will be accompanied by an increased readiness of fracture, which will call for the frequent resort to this *advantage*. Axes of this description, with several cutters all nicely fitted in their joints and pin holes, will be considerably more costly than those ordinarily made, more especially when the accidents to which they are liable, and the impossibility of getting them repaired, excepting by the maker, are taken into the account. The pins will rust in their places, will rivet up in being punched out, and to remove them the woodman must carry with him a suitable hammer and punch, and be pretty clever too in the employment of them. But a truce with objections; they present themselves in such numbers that we stop short; feeling inclined to confess that we ought to have done so at an earlier period.

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43. For machinery for *Making Window Sash;* Amos Miner, Elbridge, Onondaga county, New York, November 19.

Where stuff is to be sawed and planed, mouldings to be struck, mortising to be done, and shoulders to be cut by machinery, in the art of making sashes, it is no easy affair to steer clear of what has been previously invented and claimed, as there are already three or four patented machines for the same purpose. The operations being the same, the choice of means is necessarily limited, and it is not at all surprising that those which are identical should be employed by per-

sons entirely unacquainted with what has been done by others. If tenons are to be cut, two circular, or reciprocating, saws, placed at a suitable distance from each other, will naturally be resorted to; and if this can be called an invention, it stands a fair chance of being reinvented by every one who attempts to construct such a machine. That before us has such saws, and many other things in common with its predecessors, although they are not placed in exactly the same order; we do not, however, perceive any thing of which the patentee might have availed himself to have put in a legitimate claim to invention, unless the particular arrangement adopted by him would have answered the purpose, which we very much doubt; he, however, has merely described his machine, and claimed nothing.

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44. For a *Thrashing Machine;* David Porter, Boonville, Oneida county, New York, November 19.

There are included in the claim under this patent both a thrashing machine and a horse power by which to drive it. We apprehend that upon examination these would be found to be two distinct machines, and that if they were new they should have been the subject of distinct patents; it so happens, however, that there is nothing novel in either of them; and as such thrashing machines have not unfrequently been propelled by such horse powers, it was well enough to place them side by side as old acquaintances The former has a wooden cylinder covered with sheet iron and set with teeth, and a concave of cast iron. The latter is the ordinary combination of wheels and pinions, such as has been several times patented, without the possession of any claim to originality even when this sanction was first sought for it.

The claim is to "a cast iron concave to a wood machine, and the screws to regulate and govern the same; and the shaping of the teeth, and the rounding of the same so as to prevent the machine from breaking the grain, or cutting the straw; and also the hand and horse power."

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45. For *Locks for Doors, Safes, Chests, &c.;* William Parr, and James F. Fowler, city of New York, November 19.

There is not any thing very special in the arrangement of the respective parts of this lock which gives to it any preference to many others which have been patented here and in Europe.

The hole in the barrel of the key may be triangular, or in any other form adapted to turn the pin, or axle, upon which it is to fit, and which carries the cam that is to move the bolt backward and forward. This cam is in the form of a segment of a toothed wheel, there being corresponding teeth on the lower edge of the bolt. The security is intended to be derived from a number of catches, or sliding bolts, which must be pressed down to admit of the turning of the key. The pins upon which the pressure is to be made are of different lengths, and the face of the barrel of the key is adapted to them, having de-

pressions or projections thereon, which suit the respective parts to be depressed. The key itself is, on its outside, a round barrel merely, like that frequently used for latches.

"These applicants claim the apparatus for moving the main bolt, including the sliding bolts, springs, and tumbler, and the adaptation of the key thereto; but they claim no certain number of sliding bolts, which may be varied at pleasure from one to any required number, the steps in the key being varied to correspond therewith."

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46. For *Machines for Manufacturing Tobacco;* John B. Rappelyea, and Joel Barns, Covington, Campbell county, Kentucky, November 19.

The manufacturing process, as carried on by the machine described is said to be both simple and new, and "so perfectly *systematic* and *mathematic* that a boy fourteen years of age may be intrusted to manufacture by, and understand the whole economy of, the machines in two weeks." The machinery specified consists of a long table with a number of appurtenances;—what is called a diverge press—a cutting machine—and a double cast iron press. We shall not attempt to describe these separate parts of the machinery, but will observe that the tobacco is to be pressed in a very powerful press, so as to form thin sheets; it is then divided into equal portions by the cutting machine, which cuts it by means of circular knives into strips, which strips are cut across so as to form pounds, half or quarter pounds, or pieces of any other weight. The claim is to "the double iron press, the diverge presses, and cutting machine; circular roller; friction roller with iron collars; together with the mode of gearing and manufacturing systematically and mathematically, from one ounce to two pounds."

The specification of this patent has been drawn up with much labour, but it is by no means a model of clearness in the art of describing machinery. The drawings, however, which are very well executed, go far towards removing any defect from this cause, and induce us to believe that much more might have been claimed under the patent than has actually been done.

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47. For an improvement in the *Mode of Distributing the Ink, and applying the same to types* in letter press printing; John Prince, city of Philadelphia. Patent first issued April 23, 1830. Surrendered and reissued on an amended specification November 19.

Mr. Prince obtained a patent for his apparatus on the 3d of December, 1829, and his patent of April, 1830, was intended to be taken for an improvement on his original machine, but not clearly expressing this fact, it has been surrendered, as above stated. The claim, as now made, is "the manner of placing the springs, as described, and so connecting them with the sliding frame as to cause them to move the inking rollers backward and forward over the form; and also the effecting the same by means of a single rack."

48. For improvements in the *Machinery for Distributing the Ink, in the Hand Printing Press;* John Prince, city of Philadelphia, November 19.

In the machinery formerly patented by Mr. Prince the traversing of the inking rollers was effected by springs coiled in barrels, in the manner of clock springs, but for these he has now substituted springs wound cylindrically, in the manner of bell springs, which are contained within tubes. He has also added friction rollers, to lessen the friction in the traversing of the inking roller frame; to these two points the claim is confined.

We have seen the apparatus in action; it appeared to operate well, with scarcely any sensible increase of labour to the pressman, and it was well spoken of by the printer who had it in use.

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49. For an improvement in the *Mode of Producing Artificial Light;* Samuel Morey, Oxford, Grafton county, New Hampshire, November 19.

(See Specification.)

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50. For *Cisterns and Reservoirs;* Horace J. Shumway, Van Buren, Onondaga county, New York, November 19.

Cisterns, or reservoirs, to hold water, or other liquids, are to be dug in the ground, and the walls of earth are to be plastered over by a cement made of hydraulic lime and sand, mixed in the usual proportions. The novelty in this proceeding consists in applying the cement directly upon the surface of the ground, without first building a wall of brick or stone. The advantages said to result from this are several; besides the economy of the process, it is stated to be more durable; as the change in the brick or stone wall, from settling, expansion and contraction, &c. is said to crack the plaster, while such accidents will not take place with earth walls.

It is proposed, in addition to the sand, sometimes to use gravel, which may either be mixed up with the cement, or applied to the surface of it whilst in a moist state. The claims made are "for plastering upon earth walls instead of plastering stone, brick, or wood, as heretofore; for applying said cement to the constructing and building of cider cisterns or vaults, tanner's vats, salt vats, and reservoirs for holding large quantities of liquids. For the use of gravel to stiffen or harden the mortar, which has not been heretofore used in the manner specified, to form a cement, or to stiffen the mortar."

In a firm clay soil, we have no doubt that cisterns made in the way specified would answer the intended purpose; but in the greater number of situations, we think they would not, as it cannot be intended to give to the water cement lining such a thickness as shall sustain the pressure of the earth, which, in most places, requires a wall of considerable strength. In cisterns which are to be kept constantly full, the pressure of the contained liquid would do much towards sustaining that of the earth, but in those which are sometimes to be empty

the danger would be greatly increased. The last item of the claim, that of using gravel to stiffen the cement, is one which certainly cannot stand, as this article has frequently been used both with ordinary and with hydraulic lime in forming a cement.

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51. For an *Odometer, or machine for telling the distance traveled in a wheeled carriage;* William A. Turner, Plymouth, Washington county, North Carolina, November 19.
(See specification.)

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52. For a *Mortising and Tenoning Machine;* Loammi Sprague, Micajah Noyes, Thomas Lund, jr., and Jesse Ayres, Dunstable, Hillsborough county, New Hampshire, November 19.

We shall not attempt to describe this machine, as it consists of too many parts for mere verbal description; and most of these in their individual capacity are similar to those used in other machines. The patentees have not claimed any particular part as new, but have confined themselves to "the general construction of the before described machine, with the arrangement and adaptation of the several parts to produce the effect intended."

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53. For a *Straw Cutter;* John Shaw, city of Philadelphia, November 19.

The advantages of this straw cutter are said to consist in its cheapness, and the ease and rapidity with which the work may be done by it. With respect to its novelty, we have no information, but think that though there certainly is not much of this ingredient in it, enough might be discovered upon which to found a claim, although not a very broad one. There is to be a trough, of the common construction, to hold the straw; but there is no provision made for advancing it. There are uprights at the front end of the trough, which serve as guides to a frame to be worked up and down by a treadle. A knife crosses this frame obliquely, and a board is fastened upon the frame, as much in advance of the knife as the length of the straw to be cut, and against this its ends are to rest.

Such, we believe, is a true description, but in giving it we have been compelled to guess a little, as the explanation given is not a very clear one. If there is any novelty in the affair it is in the manner of placing the board to govern the length of the straw; but in this there is a defect, as in descending it must necessarily rub upon the ends of it, and thus create friction.

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54. For *Apparatus to propel canal and other vessels;* Jeremiah Smith, of the city of New York, and John Brown, of New London county, Connecticut, November 19.

Ropes, or chains, are to be extended along rivers, or canals, and the boats are to have band wheels on them, turned by steam, or other power, to give motion to these wheels.

We venture to predict that this mode of passing *along* rivers and canals will not make a fortune for the inventors, for where it has been essayed in *crossing* them it has been found to be a troublesome business; the plan is equally deficient in novelty and in utility.

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55. For a *Cooking Stove to burn anthracite coal;* Hezekiah Steel, city of Hudson, New York, November 19.

This stove is to have two vertical cylinders to receive the fuel, and these are to be placed at such a distance from each other as to allow of an oven to stand between them. The heated air from each fire may be conducted under and around the oven, when baking is to be performed; or, by closing dampers, it may escape directly into the flue above the oven. The grates are to be hung on pins, that they may be inverted in order to discharge the fuel, and in the cast iron hearth there are slides to lessen, or to close, the draft.

"The form of said stove, the construction, the application of the heat to the oven, and the continued increase of space for the passage of air from the fuel to the flue, I claim as improvements not heretofore used or known."

The principal novelty in this stove is not included in the foregoing claim; it is that of burning two fires to heat a single oven; as respects the other points, we see nothing new in them in the loose and general manner in which the claim is made; some peculiarity in the construction of the parts ought to have been pointed out, to enable us "to distinguish the same from all things before known or used." If this had been attempted, the claim would have been confined within narrower limits than it is, although expressed in a greater number of words.

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56. For an improvement in the *Grooving Plane Bit;* John Shugert, Lawrenceville, Alleghany county, Pennsylvania, November 19.

This grooving plane is a tongueing plane, the title therefore is a misnomer, but this is a point of little importance. There have previously been patents granted for making the bit of a plane of this kind in two parts, so that the distance between them may be regulated. In the present instance the two parts are to be united at their upper ends by a plate of iron; this plate is to be riveted to one of them, and screwed to the other in such a way as to fix it firmly, but still to leave it capable of being set closer or wider. "The patentee claims as original, the back plate, the screw, and the mortise in the back plate."

If the original claim to the making of such irons in two parts was valid, the present patent might be for an improvement thereon, but this would not give a right to the original invention.

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57. For an improvement in the *Water Closet;* Edward Robinson, city of New York, an alien who has resided two years in the United States, November 19.

This patent is taken for the particular arrangement of a crank and lever which operate in the action of the water closet, the general construction of that apparatus remaining unchanged. Although water closets are but little used with us, they are very common in Europe, and a considerable number of patents have been obtained for them both in England and in France; we know nothing, however, adverse to the special claim above set up.

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58. For a *Machine for Cutting straw, hay, potatoes, &c.;* Amos Russel and Noah Davis, Syracuse, Onondaga county, New York, November 19.

The straw, or other article to be cut, is to be put into a vertical hopper, in which it will sink down by its own gravity. Under the hopper a cylinder, 28 or 30 inches in diameter, revolves, and carries knives, which project from its surface to a distance equal to the length of the straw. These knives are placed diagonally, and act against a steel plate on the lower edge of the hopper. The claim is to "the cylinder, and its position under the hopper, and the manner in which the knives cut against the steel plate."

A straw cutter, with a hopper constructed in a similar way, was patented by James Luckey on the 9th of March, 1833, and is noticed in vol. 12, p. 176, but in that a board carrying the knives had a reciprocating motion.

What, however, is still more remarkable, is that a cutting machine patented on the same day with that under consideration, No. 27 in the present list, is precisely like it, having a cylinder operating in the same way. The hopper, or case to contain the straw, &c., is in each of them represented in the drawing with folding doors. The verdict, we suppose, must be "chance medley."

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59. For improvements in the *Pump for raising Water;* Jesse Reed, Marshfield, and Josiah Reed, East Bridgewater, Plymouth county, Massachusetts, November 19.

The pump described is intended to be made of cast iron in its upper part, and to have a tube of lead to extend into the well; particular modes of arranging the valves are described, principally with a view of rendering the junctions tight, and of allowing the lower valve to be opened permanently, that in frosty weather the water may escape through it. Three different modes of connecting the pipes and valves by plates of iron, are described, and the claims are to "the different modes of adjusting the plates, and connecting with them the flanch of the pump and lead pipe; and the mode or method of letting off the water from the cylinder."

The patentees have very properly confined themselves to the particular arrangements which they have described, and to these they have a right; we do not, however, think them of much importance, not being aware of any existing difficulty which they have overcome, although the patentees, of course, think differently.— There have been modes devised for opening the lower valve in me-

tal pumps, but in cold climates such pumps ought not to be employed for common purposes, their extreme liability to freeze rendering them very troublesome: and even in warm weather wood is to be preferred by those who do not wish to drink warm water.

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60. For *Raising Water for turning Mills;* William Mead, Pittsburgh, Allegheny county, Pennsylvania, November 19.

It is unnecessary to describe the apparatus here patented, with its array of cylinders, pistons, valves, fly wheel and levers, intended to raise water, because it will never carry this intention into effect. Perhaps it is not strange that persons who know nothing of mechanics should think themselves wiser than seven men who can render a reason; but it certainly is a little surprising that when a model of a machine might be made of tin, or other cheap material, and its operation tested, men should go to the trouble and expense of making a model for the office, and taking out a patent for an untried project, and especially for one which contains within itself the very essence of a perpetual motion.

In the present instance water is to be forced by hand, or otherwise into a cylinder, "until the pressure becomes sufficiently great." The water is then to set pumps at work, which are to supply a portion sufficient to rush into the buckets of a water wheel, causing it to turn round, and in so doing to drive all the machinery of a mill; to whirl round a heavy fly wheel; vibrate levers; open and close valves; pump up water for its own maintenance; and so to continue in operation, neither exhausting itself, or the reservoir from which it is supplied.

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61. For an improvement in a *Machine for Dressing Spokes;* Daniel H. Wiswell, city of New York, November 19.

The present patent is taken for an improvement in the knife or cutter used in a machine for which Mr. W. originally obtained a patent. The cutters, as formerly made, were changed in form by grinding and sharpening, and would not therefore continue to cut the spokes precisely alike; those now used are bent so that their inner sides would fit exactly on to a dressed spoke, for one half of its width; the outer edges are beveled, and when ground or sharpened, the form of the inner edge remains unaltered. A number of these cutters are fixed around a wheel, thus forming a ring of cutters, against which the spoke is to be brought up, as heretofore; the general operation of the machine remains the same as formerly.

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62. For *Straps for Pantaloons;* Enos Wilder, Boston, Massachusetts, November 19.

The patentee says that his "invention consists in the application of spiral springs, with cat gut strings, or other material," to pantaloon straps; and the advantages proposed are the "giving elasticity to the strap, and preventing any great or sudden strain upon the pantaloons, and to keep them properly adjusted."

63. For *Dying Woollen goods;* Hugh Young, Wheatland, Monroe county, New York, November 19.

In the specification of this patent, a description is given of the manner of dissolving grain tin in a mixture of nitric and muriatic acids, with certain precautions to be observed, most, if not all, of which, however, are well known to every competent chemist and scientific dyer. The necessary mixtures and manipulation in dying scarlet, crimson reds, orange, &c. &c. are likewise given, and a claim is made to "the invention of mixing and compounding the acids, and of applying them in the manner mentioned, to the purposes of dying." There may be novelty in some parts of the procedure, but in most of them there is not any, and as the new and the old are not distinguished from each other, we are left in the dark as regards what it was intended to patent; a common and fatal error.

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64. For an *Oil or Spirit Gas Lamp;* Joseph M. Truman and George Truman, Penn township, county of Philadelphia, Pennsylvania, November 19.

This lamp is intended principally for streets, public buildings, halls, &c. where a brilliant and steady light is required. It is constructed for the combustion of oil, tallow, or other articles capable of being burnt in lamps. The inventors denominate it a gas lamp, because the upper part of the reservoir for oil, &c. forms what they denominate a retort, in consequence of its being so constructed that the flame of the burning wick shall heat it sufficiently to decompose the oil, and partially convert it into gas.

The flame which ascends from the reservoir is surrounded by a glass chimney, in the usual way; and this glass chimney is surmounted by a metallic tube, into the lower part of which the glass enters. The metallic tube extends above the glass, to the height of from twelve to sixteen inches, and is called the illuminator, as, by its aid, the flame may be made to ascend to nearly the top of the glass chimney, and to afford a very brilliant illumination, without any smoke; this illuminator appears to be one of the most essential features of the lamp. The patentees say "What we claim as our invention is the employment of that part which we denominate the retort, used in the way herein described, and consisting of one or more plates to be let down upon the flame; we also claim the lengthening out of the glass chimney by means of the illuminator, without which the combustion will not be rendered effective."

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65. For a *Double Spring Truss for Hernia;* Daniel Weaver, city of Baltimore, November 19.

The patentee, in his petition, states that the "double spring truss consists of two trusses connected in front by a hinge; each half of the truss passing round one side of the body, and forming an exact counterpart to the other." The double spring is to be used whether the hernia be only on one or on both sides; there are to be two pads behind, one bearing on each side of the spine. The two pads are con-

nected by a short strap, and there is a strap and buckle at the side to fasten and adjust the truss. There is nothing peculiar in any other part; the pad, or pads, in front and their connexions, as described, being very similar to others in use. There is no claim.

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66. For a *Portable Razor case and Dressing box;* Harvey Wright, Bristol, Hartford county, Connecticut, November 19.

We have here a brief specification of the contrivance above named, being told, in some ten or twelve lines, that the said box may be made of wood or metal, of different dimensions, having a lid hinged on one side of it, with a piece of looking glass within the lid. The body of the case to have divisions for razors, soap, brush, strap, comb, paste, &c. "and the whole is connected together so as to be easily portable."

We will not offer a long comment on so short a text, but dismiss the subject with the pithy observation, that "comment is unnecessary."

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67. For an improvement in the mode of *Tuning Piano Fortes, and other stringed instruments;* John J. Wise, city of Baltimore, November 19.

We are very apprehensive indeed that the main end which it is proposed to accomplish by the invention before us, will never be attained, namely, the enabling a person without a musical ear to tune a piano forte, or other stringed instrument, by mechanically measuring the tension given to the respective strings; and we are quite sure that the apparatus here patented for the purpose will not effect it. There is some ingenuity about the thing, but more fancy, and although this latter quality may operate very well in poetry, it is of but little avail in such prosaical articles as mechanical contrivances, even when they are applied to musical instruments.

A barrel, like that for containing a watch spring, but about four inches in diameter, has the socket of the turning hammer passing through its centre as an axis. On the upper side of this box, which may be called the handle of the hammer, is a dial plate, with an index to point out the tension of the string, which is to be determined by the corresponding tension of springs within the box, these springs being acted on by turning it. We cannot, without the drawings, attempt to describe the particular arrangements, and these, after the opinion which we have given we shall not be expected to furnish. The tuning pins are to be fixed by a very complex contrivance, so that each of them may be loose whilst the tension of the string is ascertained, and then tightened by a thumb screw.

It is also proposed, in some instances, to draw up two strings at once, by allowing one continued wire to form two unisons; the doing of this, however, was made the subject of a special patent by Mr. Babcock, some three or four years ago, and cannot therefore be again legitimately claimed. The claims made are to "the arrangement or mode by which the movable ends of the strings are fastened or

loosened, as well where there is a tuning pin to each string, as where the piano is so strung as to require only one tuning pin for two strings. The mode of tuning a piano, or stringed musical instrument, without the assistance of the ear, by measuring and ascertaining the degree of tension necessary to produce any required note upon a given string, or strings, and furnishing the tuner with the means of applying that degree of tension precisely, and mechanically, and the combination by which the end desired is effected."

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68. For *Wheels for Rail-road Cars;* Ross Winans, Civil Engineer, city of Baltimore, November 19.
(See specification.)

Note.—In the list of Patents for September, in the last number, the six from 40 to 45 inclusive, dated on the 19th of that month, should have been placed in the list for November 19th, making the whole number issued on that day, 74.

SPECIFICATIONS OF AMERICAN PATENTS.

Notice of a patent for Lubricating the Piston, Piston Rod, &c., and improvements in other parts of Steam Engines. SAMUEL HALL, *Bassford, Nottingham county, Great Britain. Granted in pursuance of a special Act of Congress, passed March 2nd,* 1833. *Issued November* 19.

The title of this patent includes "an improved piston and valve for steam, gas, and other engines; an improved method of lubricating the piston rods, valves, or cocks, of such engines; and of condensing the steam and supplying water to the boilers of such steam engines as are wrought by a vacuum produced by condensation." The patentee thus sets forth his claims:—

"FIRST.—As respects lubrication, my claim consists in the effecting of the separation of the oil, or other lubricating matter, from the water, by the process of the distillation, or evaporation, and the consequent more accurate separation of the water from the lubricating matter, than by the methods described in my aforesaid patent; and by the above mentioned use of the boilers whereby the size of the separating vessels described in my aforesaid patent may be dispensed with; and in taking the oil for the purpose of lubricating, from the surface of the water within the boilers, even when in a state of agitation caused by ebullition, whether the oil be separated and taken away by the apparatus I have described, or by any other suitable means.

"SECONDLY.—As respects the condensation; it consists, *first*, in keeping the water, or other fluid resulting from the condensation of steam, or vapour, more effectually within the refrigerating pipes, by

tubes inserted in the caps at the ends thereof, as already described, or by any other suitable means; *secondly*, in effecting a more uniform passage of the cold water among the refrigerating pipes, from one end of the cistern to the other, by means of plates properly disposed for that purpose; and *thirdly*, in opening the foot valve of the air pump when applied to my improved apparatus, by any suitable means, so as not to require such pressure of water, or other fluid, or vapour, against it, as is requisite to open it, whereby the vacuum may not be so good on the one side of the valve as on the other; whereas, by the opening of the valve in the way I have described, or in any other proper manner, the vacuum may be more uniformly the same on each side of the valve.

"Thirdly.—As relates to my claim to the other useful purposes to which my method of condensation is applicable, it consists in the application of my apparatus for, and method of, condensation described in this patent, as well as those described and limited in my aforesaid patent, whether used separately or together, for the purposes of distillation, evaporation, and desiccation, of all matters to which they are applicable, and whether those processes are performed in vacuo, or otherwise, and whether the processes of distillation of spirituous or other liquors be applied to produce motive power as well as to obtain the respective products of distillation."

It will be seen that the patentee, in the foregoing claim, refers to a previous patent, and in the commencement of the specification it states the present application to be for "certain improvements on certain parts of a patent of the United States of America, for which he made application on the twenty-third day of June, 1832, entitled a patent for *An improved piston and valve for steam, gas, and other engines; and also an improved method of lubricating the pistons, piston rods, and valves, or cocks, of such engines, and of condensing the steam, and supplying water to the boilers of such steam engines as are wrought by a vacuum produced by condensation.*" This reference appears, under existing circumstances, to be incorrect, as no such patent is in existence. Mr. Hall, it is true, made application to Congress to authorize him to obtain one therefor, but his application was unsuccessful. The patent, however, was obtained in England, and is dated December 22nd, 1831. The specification of it is to be found in the "Repertory of Patent Inventions," for December, 1832, and in other English Journals; to understand the references made, we must, therefore, apply to a foreign source.

In the English patent, a mode of lubricating the piston, &c. by injecting oil into the cylinder, is described; and under the same head, the method of separating the oil from the water is pointed out; in the patent before us, we find nothing about the lubrication, excepting in the title, but only an improvement in the manner of effecting the separation of the oil, or other fatty matter, from the water. The mode of condensation adopted, and described in the English patent, consisted in avoiding the usual injection of cold water into the condenser, by a peculiar mode of using metallic surfaces, which were the coverings of channels through which the water formed by the condensa-

tion of the steam is to pass. The present patent, it will be seen, is for an improvement upon the particular mode described. The third head in the present patent relates, mainly, to the use of the condensing apparatus as a refrigerator in distilling, and in analogous processes.

We have no doubt that a part of Mr. Hall's contrivances are real improvements; as, for example, his manner of constructing, packing, and lubricating his pistons, as described in his English patent; this, however, and all the other points there claimed are with us public property, the improvements thereon, set forth in his American patent, being all that he can claim here.

There are several things relating to our patent laws which render it desirable that they should pass under revision by the Legislature, and among them is the propriety of granting patents to foreigners residing abroad. All special legislation upon the subject is a great, and must be an increasing, evil, for when a special act is passed in favour of one foreigner, it holds out a lure to others to seek the same favour; and however careful a committee of Congress may be, it will often be impossible for them to obtain a correct judgment of the particular value of an invention presented before them; we think, therefore, that such patents ought to be uniformly denied, or generally granted. We were, at one period, opposed to the policy of granting patents to foreigners, and as a matter of mere policy, we should still entertain the same opinion, as there are but very few instances in which the invention will not reach us from abroad, unshackled by any monopoly; but, assuredly, there is something due to comity as well as to policy, and while so many of our own citizens are allowed to tax the subjects of other countries for their own benefit, it would seem right that we should give something to the principle of reciprocity. It would appear proper in this case, however, not to admit foreigners to the privilege on the same terms with our own citizens, but to charge them as high a fee as that demanded from Americans in their respective countries.

Specification of a patent for a Lamp, or Apparatus for Producing Artificial Light. Granted to Samuel Morey, *Oxford, Grafton county, New Hampshire, November* 19, 1833.

This improvement consists of a metallic cylinder of such dimensions as may be desired, strong enough to bear a pressure of three or four pounds to the inch. In the centre of the top of this cylinder, there is to be a small tube inserted, about half an inch long, with a single hole in the upper end, of about from one-twentieth to one-sixtieth of an inch diameter. Round this small tube with a single hole, there is to be another tube an inch or more in diameter, and about an inch long, soldered to the top of the cylinder, having a cap that may be screwed on, or taken off; in the centre of which cap a screw may be fastened about one-eighth of an inch or more diameter. Around this screw, and in a circle, holes are to be made, about one-fiftieth or

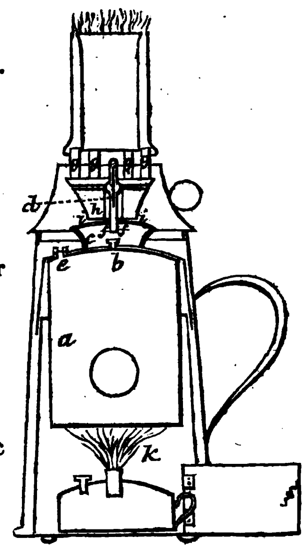
one-sixtieth of an inch diameter, and about one-third of an inch apart. A conical tube, about three inches long, and about three-fourths or more of an inch diameter, at the lower end, having a bar across near the bottom, with a hole and screw in the centre to fit that in the lower end of the conical tube. In the top of the cylinder a safety valve is to be affixed. It is then ready for use. To use it, put into the cylinder, through the safety valve, half a gill, or more of spirits of turpentine, and about the same of water. Apply heat to the cylinder until the vapour issues pretty freely through the conical tube on the top. If a flame is applied to that vapour, it takes fire, and burns with a beautiful white flame, like a gas light. If there is any smoke, turn the conical tube on the top to the left, which will admit more air at the bottom to be mixed with the vapour in its ascent up the tube. As the vapour issues through the small holes in the cap, into and through the conical tube, by the pressure in the boiler, it will mix with, and carry along through the tube, in passing along, more or less air, in proportion to its velocity, by which means it is easy to make these lamps burn with all degrees of intensity, from that of a white flame and smoke, to that of a very intense white, to blue and white, and to that of all blue, and from that to perpetual explosion. These cylinders, which may be made to hold half a pint, or many gallons, it will be well to enclose in such a manner as to preserve the heat; thin plates of tin answer well, and it will require that they be as much longer than the cylinder as will allow of a standing on the bottom under the cylinder, when desired to heat it with oil, or alcohol. It seems immaterial how, or in what method the heat is applied, so that it is steady, and can be readily lessened or increased. To light-houses, or wherever a large flame is required, most likely nothing will be better, or cheaper, than anthracite coal, unless the heat is applied from the same stove, or lamp, after once in operation. The flame of a lamp of alcohol, not much, if any, larger than that of a common candle, will cause vapour enough to rise, or issue, to give the light of ten or fifteen candles, and heat enough to boil a two quart tea kettle in seven or eight minutes. When the vapour issues freely and rapidly out of the conical tube, and is inflamed, it is plain to see the effect at least of the rapid recomposition of water. The flame will be a light blue for some inches above the tube, and on the outer edge of it, there will, apparently, be a border, which has the appearance of decreasing rapidly towards the outer edge, and becomes entirely invisible in about one-eighth of an inch. The heat increases as the flame becomes less and less visible, and this is continued not only to where there is no appearance of any flame, but to a sensible distance beyond; where the heat is more intense than any where within the visible flame; which is made apparent by holding a fine wire across the flame. There does not appear to be any smell of turpentine from these lamps, unless the vapour is allowed to escape without being inflamed. Alcohol and spirits of turpentine may be made to burn in the same for many uses, particularly for lighting and warming rooms; but when alcohol is burned, it will require only about one-fifth or one-sixth of spirits of turpentine to give it the white

flame; or alcohol may be mixed with water in any proportion, but the greater the proportion of water, the more spirits of turpentine will be required. In the latter part of my experiments, I have generally made the covering in the form of a common tin plate coffee-pot, as much larger than the cylinder as would allow of setting in a lamp on the bottom, through an opening on one side. The use and object of the box on the upper end of the cylinder, is to answer, in a great measure, the purpose of a gasometer in gas works. It allows of working with much pressure in the boiler, thereby giving a much steadier issue of vapour. And as it passes into the box with a number of holes, the issue from those holes is easily adjusted, so as to have it mix with a due proportion of atmospheric air before it is inflamed, and with a velocity that will insure its further supply, sufficient to insure a most perfect combustion; giving to this mode great and decided advantages over all others in burning the vapours of the liquors before mentioned, as well as all others that can be conveniently evaporated, and that are combustible: and I can see no reason why carburetted hydrogen gas may not, in this way, be burnt with a large volume of flame, without any smoke, which will in many cases be very useful. The great and surprising volume and quantity of light and heat given out by these lamps and stoves, appears to me, evidently, to arise from the perpetual decomposition of the water in the combustion, and its recomposition from the air within the flame, as well as that surrounding it; which is owing in a great measure to the vapours of the liquors which contain much carbon as well as hydrogen, being so intimately mixed and blended with a great supply of atmospheric air, both before it is inflamed and after, and that constantly. These lamps have this great advantage, that the same lamp can be made to burn regularly with the light of one or two candles, or twenty, or thirty, or more. Nothing can be more convenient than these lamps are for cooking, to a certain extent; with a half gill of spirits of turpentine, as much water, and one-eighth of a gill of alcohol, two, or more, two quart tea-kettles can be made to boil in less than five minutes each, and bread toasted and meat enough for three or four men may be boiled. In boiling meat, it will be necessary to turn the tube off laterally, a few inches, and to have the flame blue or nearly so. So again, nothing, I should think, could be more convenient for soldering, than these lamps; for the moment you bring a piece of thin sheet copper in contact with the blue flame, having a piece of silver solder, or common silver and borax on it, the solder is instantly melted, and the copper very soon. So also small brass wire brought over the flame, instantly drops to pieces; and small copper wire is as soon melted, and very fine iron wire, when the mixture of air and vapour is in the best proportion, is instantly inflamed.

What I claim as my invention, and for which I ask a patent, is an improvement upon the mode of producing artificial light and heat for illumination, or other purposes, by mixing together, in suitable proportions, water, alcohol, or water and alcohol with spirits of turpentine, in a cylindrical, or other shaped, vessel, and inflaming the vapour extricated by heating the said mixture—which improvement

consists principally in causing the vapour of the liquors to issue through holes from the evaporator into a small box, or reservoir, and from that box, or reservoir, through such a number of very small holes, into and through a conical, or other shaped tube, with such force and velocity as will insure its mixture with as much atmospheric air, as will, when inflamed, induce a perfect combustion,—the principles of which improvement are hereinbefore described. And I do hereby declare, that I do not intend to confine myself to any exact form or proportions in the apparatus which I employ, but to vary the same as may be desired, in any manner which admits of my operating upon the same principle, and in which a similar effect is produced. SAMUEL MOREY.

Section of Morey's Lamp.



a Metallic cylinder.

b Small tube one-sixtieth inch diameter.

c Another tube one inch diameter.

d Screw.

e Safety valve.

f Small apertures through which vapour issues to the tubes

g Tubes.

h Conical tube or receiver.

i Place for the admission of atmospheric air.

k Heat for generating vapour.

Remarks by the Editor.

The statements of Mr. Morey may be relied on most implicitly, in whatever relates to those facts which have come under his own observation; and he has been an indefatigable experimenter and observer, more especially as regards the production of flame by the combined action of alcohol, essential oils, and water. In an article published in Silliman's Journal, vol. xxv. p. 150, he says, "I have no doubt that I have tried lamps, stoves, and machines, in more than four thousand different forms, for effecting these purposes; and yet not many months have elapsed since I have felt entirely satisfied."

"The experiments which I have made, have proved practically, that an engine with a power equal to driving a boat four miles an hour, and a rail-road car twice that distance in the same time, with

ten or twelve passengers, may be made for one hundred dollars; and that the engine with its preparing vessel (a substitute for the boiler in the steam engine) need not weigh one hundred pounds—and the expense of working it will not exceed ten or twelve cents per hour. There are certainly no difficulties to be removed. These facts have been verified practically and repeatedly before hundreds of people.

"Some recent improvements in the mode of constructing lamps for burning water to produce light and heat, have perfected the operation for these purposes. It now carries demonstration in every form."

The foregoing observations are succeeded by some account of the effects produced by the flame, similar to those noticed in the specification of his patent; and Professor Silliman adds—

"We have seen some of Mr. Morey's experiments, and can testify to the correctness of his statements, as regards the great amount of heat and light evolved by combustion of the vapour of water mixed with that of spirits of turpentine or alcohol, and duly modified by common air. The results are very striking and beautiful, and we can see no reason why they should not prove of great practical utility."

We have not witnessed the operation of Mr. Morey's lamp, but as we have already said, we are satisfied as regards the correctness of the statements, although we by no means agree with the gentleman in his theoretical views. In the article to which we have alluded, Mr. M. has given these at some length, but in doing so he has assumed as settled certain points with respect to the nature of electricity, which are by no means generally admitted by philosophers; and upon these he has founded his theory, or rather his hypothesis. We, however, should deem it out of place here, to enter into an argument upon this subject; so far as the lamp and the patent are concerned, the question is one of facts, and it will afford us much more gratification to find that this invention is publicly introduced, generally approved, and fully compensating the author of it for his indefatigable and meritorious exertions, than we should be to establish our own theory, if we have one, of its *modus operandi.*

We will, however, make a remark or two, with respect to one point in the theory, that is, on the "burning of water." The idea of doing this is not peculiar to Mr. Morey, as others have taken patents for "water burners;" and certainly, the introduction of the vapour of water among burning fuel has, under many circumstances, the effect of quickening the combustion, and, more especially, of enlarging the flame; still we do not believe, in spite of this sensible evidence, that these effects are produced by the decomposition and recomposition of the water, but think that they arise from its mechanical action in diffusing the material of flame so as to expose it to a larger portion of atmospheric air. We have before made the remark, and will here repeat it, that so far as the production of light and heat are concerned, it would seem to us that the simultaneous decomposition and recomposition of water must neutralize each other.

Specification of a patent for an Odometer, or machine for indicating the distance traveled by a Wheeled Carriage. Granted to WILLIAM A. TURNER, *Plymouth, Washington county, North Carolina, November 19th,* 1833.

(WITH A COPPERPLATE.)

To all whom it may concern, be it known that I, William A. Turner, of Plymouth, in the county of Washington, and State of North Carolina, have invented an improvement in the Odometer, or machine for indicating the distance traveled by a wheeled carriage of any description, and I do hereby declare that the following is a full and exact description thereof.

As the mode of applying this instrument to any other carriage will be obvious from the explanation of the way in which I have applied it to a stage, or other four wheeled carriage, I shall in my description confine myself to a vehicle of this kind.

I drill a hole, longitudinally, through the centre of the axle of one of the hind wheels, to admit a rod which may revolve within the said axle, extending from the outer end thereof, to the middle of the axle. As such axles are usually bent, or curved, under the body of the carriage, the hole for the rod will, in such case, be free from the axle before it reaches the middle thereof; or, if straight, the axle may be constructed with an eye, or opening, in the middle, to allow the endless screw, or pinion, to act in the manner required. On the outer end of this rod, within the cap of the hub, I attach a piece at right angles thereto, having on it a jointed, or hinged, piece, so constructed that a pin projecting from the inside of the cap of the hub, will touch against it, and carry it round in one direction, but in consequence of the hinge, or joint, giving way before the pin, it will not turn it in the opposite direction; this is shown at *a* in the accompanying drawing, *b* being the rod within the axle; clicks, or stop joints, of this kind, are well understood by workmen. This click, when the carriage is backed, allows the rod, with the machinery attached to it, to remain at rest. Entirely to prevent all danger of the wheel work moving backwards from any stiffness in the click, I usually place a ratchet wheel upon some part of the revolving rod.

That end of the rod which is inwards, and which reaches to the middle of the axle, has on it a bevel wheel. or an endless screw, *e*, which mashes, or takes, into a wheel *f*, placed upon an axle, or revolving rod, at right angles to the former, extending out above the perch, and inclining a little upwards towards the body and front end of the carriage. This rod is made to run in proper boxes, or bearings. Soon after it leaves the axles, and at any convenient distance therefrom, it is furnished with an universal joint, *g*, in order that it may suffer any necessary deflexion from a straight line, without experiencing a resistance which shall be injurious, or obstruct its motion; and when it reaches the bottom of the body of the carriage, or nearly so, I employ a second universal joint, *h*, as the rod at or near

that point is subject to some change in its direction. Between these two universal joints, the rod by which the motion is conveyed from the gearing near the axle, to a revolving rod or axle, *i*, lying within the body of the carriage, is made double as at *j*, in such a way that one part of it may slide within the other, and admit of its being lengthened or shortened by the pitching of the carriage, and by its motion from the elasticity of the springs and braces upon which it is hung; whilst at the same time the revolution of the rod itself is not impeded, and the universal joints allow a free lateral motion. One of the most simple modes of forming this slide, and which answers perfectly well in practice, is to make one part of the rod a socket with a square hole, and the other portion square, fitting into and sliding freely in this hole; this rod I denominate the accommodation rod.

At the bottom of, and within, or under, the body of the carriage, the rod which conveys the motion is boxed up in any convenient way, by which means it is defended from injury; it runs in proper bearings, and where its direction is changed, as at *k k*, this may be done by universal joints, or by pinions. At its upper end *l*, it has an endless screw, a pinion, a fork and cross, or other contrivance by which it may give motion to the wheel work, and index plates which I usually place within the carriage near the upper end of the front, directly at the back of the driver. The same, however, may, if preferred, be fixed elsewhere.

When used on rail-way carriages, the axles of which revolve with the wheels, an endless screw, or toothed wheel, is formed, or placed, upon the middle of the axle, and from this, the motion is conveyed to the wheel work, in the manner, or upon the principles, hereinbefore specified.

The wheel work may be constructed in various ways; the number of the leaves upon the pinions, and of the teeth upon the wheels, being so calculated as to give the proper indication, as dependent upon the circumference of the wheel from which the motion is derived. This every competent workman is able to calculate, upon principles which do not require to be explained by me. I do not claim the application of wheels, pinions, or endless screws, to produce this effect, they having been already applied for a similar purpose; but having devised a combination of well known mechanical contrivances which is new in its application and arrangement, I consider myself as entitled to this special application and arrangement, which I shall therefore proceed to describe.

The plate upon which the distance traveled is indicated, I make oblong, as seen in fig. 2, and usually with four openings, behind which the dials, or plates, having the figures on them, revolve. The right hand opening shows eighths, or the fractional parts of miles, the next units, the next tens, and the next hundreds; these plates are seen at *m*, *m'*, *m''*, *m'''*. As they are made to revolve by a direct motion from their axes, they turn in opposite directions, and the figures shown are, therefore, upon two of them on the upper, and upon the other two on the lower, side of the wheel, as will be seen by inspecting the drawing. As it is requisite, or most convenient, to give to the wheels

an intermitting motion, I employ a kind of escapement wheel and pallet, well known in clock and watch work: *n* and *o*, figs. 1 and 3, show the construction of these wheels, *o* being the pallet, and *n* the wheel which it turns; the projecting part of the pallet taking into one of the notches, or teeth, in the wheel at each revolution: *n* in fig. 3 acts as a crown wheel, and in fig. 4 as a common flat wheel. The action throughout the index box is of this character; *p*, *p*, *p*, are spring checks. the use of which is apparent.

I will now give an example of the numbers on the wheels which will answer for a coach wheel of five feet in diameter, the usual size of the hind wheels of coaches as used in this country. I make the wheel or pinion *f*, of seven leaves; at, or near, the point where the rod enters the bottom of the carriage, I place a wheel and pallet *n o*, the wheel having six notches or teeth; the wheel of the first index plate *m*, has eight notches or teeth, and those of each of the others ten. The pinion *f* has seven leaves, and the thread of the endless screw *a* being single, the coach wheel will turn seven times whilst the pinion turns once. The wheel *n* has six teeth, and it will turn once, therefore, whilst the coach wheel turns 7×6, or 42 times. Now upon taking the circumference of a five foot wheel, with its tire, it will be found that 42 revolutions of such a wheel will carry it to a distance which is equal, as near as may be, to one-eighth of a mile, which is indicated by one revolution of the pallet *l*. The calculation for each of the other wheels being decimal, they are all made with the same number of teeth upon the wheels into which the pallets take, and with the exception of that on the arbor of the first plate, they are all flat wheels.

Fig. 4, shows the carriage and its body, with the accommodation rod, and nearly all the parts of the apparatus which appear externally, without the body of the carriage.

As it is necessary to secure the part of the apparatus within the cap from injury by dust, or otherwise, and at the same time to be able to open the cap with facility for the purpose of greasing the axle, I have devised a new mode of fastening the cap on to the end of the hoop, or barrel, of the hub, or nave; this I do by what is called a bayonet joint, having two or more pins projecting from the rim of the cap, which pass into notches on the hoop, and then turn at right angles, and lock; or otherwise I make a flanch, or rim, to project inwards from the edge of the hoop, and in this make two or more notches, which allow clips upon the cap to pass through, turn, and lock upon the flanch. In addition to their thus locking by pins, or clips, I place a spring bolt, or catch, which falls into a cavity within the box, and prevents its removal until the bolt, latch, or spring, is raised; which may be done by a nail or pin, passing through a small opening in the cap. Boxes of this description may be applied to all the wheels. The manner of making these may be seen in fig. 5, and will not require further explanation.

What I claim as my invention, and for which I ask a patent, is the carrying the motion, in the manner described, from the centre of the axle towards the body of the carriage; the employment of the

sliding rod for the purpose set forth; the giving the indication of the distance traveled, within the body of the carriage; and the general manner in which the parts are arranged for effecting this object. I also claim the mode of securing the caps upon the hubs of the wheels.

Although I have described such an arrangement of the respective parts of my machine as I think the best adapted to the attainment of the object in view, I do not intend thereby to confine myself in all points to the exact mode of construction given, but to vary the same in any manner which I may deem proper, whilst the same effects are produced by operating upon the same principle.

WILLIAM A. TURNER.

Specification of a patent for an improvement in Wheels for Cars and Locomotive Engines, to be used upon Rail-roads. Granted to ROSS WINANS, *Civil Engineer, city of Baltimore, November* 19, 1833.

To all whom it may concern, be it known, that I, Ross Winans, of the city of Baltimore, in the state of Maryland, Civil Engineer, have invented an improved mode of constructing wheels for cars and locomotive engines, to be used upon rail-roads, and that the following is a full and exact description thereof.

The more clearly to exhibit the difference between my improved wheel and those which have been heretofore employed, I will briefly point out the manner in which wheels for this purpose have been most commonly made; not intending, however, as it is not necessary for the purpose in view, to notice all the plans which have been adopted.

1st. Such wheels have been made wholly, or nearly so, of cast iron; the face, or tread of them, being cast within a *chill*, consisting of a thick rim, or hoop, of iron, which forms a part of the mould.

2nd. The wheels have been cast without being chilled, and afterwards hooped with wrought iron, which then forms the face and flanch of the wheel.

3d. A cast iron nave, or hub, has been made to receive wooden spokes, inserted in wooden felloes, which were hooped with a tire of wrought iron,

4th. The hubs have been of cast iron, with spokes of wrought iron, and a rim of wrought or of cast iron, hooped with wrought iron.

These plans have each their respective advantages and disadvantages, but neither of them has fully answered the purpose for which it has been adopted; the wrought iron hoop, or tire, upon the cast iron rims have gradually become loosened; the wooden spokes and felloes have pressed the one into the other, and the tire has ceased to bind them, an evil which wedging will not cure. To remedy these defects, and others incident to some of the wheels, is the object of my improvement.

My wheel consists essentially of three parts, namely, an *interior wheel*, the hub, spokes, and rim of which, are of cast iron; a *rim of wood*, formed in a way to be presently described, surrounding the

cast iron wheel; a *hoop, or tire, of wrought iron*, surrounding the wood, and forming the face, or tread, of the wheel.

The inner wheel is made, in some respects, like those first noticed, but the face is not chilled, nor has it the same form with the chilled face. It should be made of the same width on the rim, with the wrought iron tire which is to surround and form the tread of the wheel, say five inches. The face of the cast rim may be cylindrical for the greater part of its width, but it must in this case have a fillet, or edge, projecting up on each side of it, say to the height, and of the thickness, of half an inch, which will then give to it the appearance of a wheel with a double flanch, having a cylindrical tread of four inches in width. Instead of making the face in this form, I intend sometimes to give to it a regular declination from each edge towards the centre. A section of the rim, transversely, would then be somewhat in the form of the letter V, but with the angle obtuse. The inclination will be sufficient if the diameter at the centre of the rim is one inch less than that at the sides, or edges. Other forms may be given to the face of the rim, by which the object in view may be attained, namely, that of retaining the wooden rim in its place, without its allowing it to move out on either side.

A *rim of wood* is to be placed around this wheel, which may consist of any convenient number of pieces, fitted to each other, and to the face of the wheel. The grain of the wood is to cross the rim of the wheel, running parallel with its axis. These pieces may be fitted to the face of the wheel with great facility by driving them into a large hoop, running as a chuck in a lathe, by which means they may be turned to the form required; they may then be fastened on to the rim by wood screws, or otherwise, and turned thereon to receive the iron hoop or tire. The best thickness of this rim will be from two to four inches.

The *hoop, or tire, of wrought iron*, is to be made in the usual form, turned truly, and passed on over the wooden rim when expanded by heating it as highly as may be done without burning the wood. Bolts are then to be passed through the wrought iron, the wood, and the cast iron rims, which are secured by nuts, to confine the whole together.

The hub, or nave, in a wheel thus made, may be cast entire, instead of having those divisions, or openings, which are necessary in the chilled wheel, to allow for contraction. Although I have described the spokes and rim as being of cast iron, either or both of them may be of wrought iron, but it would be more costly, without affording any adequate advantages; those of cast iron being perfectly safe in this mode of construction.

It will be readily perceived that the wood, thus pressed between two hoops of iron, has an extent of bearing surface which will effectually prevent its being condensed by the force to which it is subjected; whilst, by its elasticity, it will tend to preserve both the road and the vehicles passing over it. If perfectly dried when put on, which may be done by artificial heat, the wood will never shrink, but on the contrary, will expand, and render all the parts the more firm. Such a wheel will have less tendency than any other, where wood

is employed, to get out of truth; and should wedging become necessary, it may be done more effectually than with any other.

The dimensions of most of the parts of such a wheel need not differ greatly from those of the cast iron wheels with chilled rims, but, like them, must vary according to their diameter, and the load they are to sustain; the following is a good proportion for wheels of three feet in diameter, intended for cars carrying three tons.

Cast iron interior wheel, twenty-nine inches diameter; hub seven inches long by six in diameter; spokes, twelve in number, five-eighths of an inch thick, and three and a half or four inches broad; rim five inches broad by five-eighths of an inch thick; wooden rim two and five-eighths inches thick, five inches deep, measuring across the rim; wrought iron tire seven-eighths of an inch thick, five inches broad, flanch one and one-fourth inch deep, one inch thick.

Although I have described the rim of wood as placed with its grain crossing the rim of the wheel, and am fully convinced that this is the best manner of placing it, yet it will answer the purpose, to a considerable extent, when running in the direction of the rim, and I do not intend, therefore, to limit myself in this respect, as what I claim as my invention is the interposing a rim or belt of wood between an interior wheel of cast or of wrought iron, and a wrought iron rim or tire, and securing the whole together in the manner, and for the purposes hereinbefore set forth.

Ross Winans.

Further notice respecting the obtaining of Patents in England.

The Editor has just received a further communication from W. Serrell, Esq. Engineer, New York, the gentleman referred to in the first article in the present number, in which he has furnished another extract from a letter on the subject of English patents, dated London, 17th February, 1834. As it not only confirms, but gives additional importance to the observations made in the above named article, we hasten to publish it.

"By the way, a man has recently arrived from New York, named S———, loaded with patents, none of which are his own; amongst them he has got J. R——'s, with the specification and drawings. R—— knows him, and S—— was much surprised to find R—— here, and still more that his patent was secured.

"This is another practical evidence of the importance of the caution which I lately sent to you, and which I hope you have had published. The moment a patent worth any thing is taken out at Washington, one of these kidnappers secures the child as his own, and goes away with it to a foreign market. A patent was recently named to an English tradesman, who directly asked if it was not an American invention; on being answered in the affirmative, he rejoined 'you are too late, my brother saw it in New York, and when he came home had one made.' The plain result of all this is, that when any thing is invented in America which is deemed worthy of being patented in

England, it ought to be secured, but not published in America, until time has been given to secure it in England. You may be assured that there are regular traders, or rather regular plunderers of patents, persons who make this a business, and do nothing else. I could furnish some proofs of the fact."

Mr. Serrell adds, "the first part of the above refers to a patent for an improvement, the inventor of which went hence by my advice, and applied to my friend in London, by whom he has been placed in a situation to obtain a handsome remuneration for his invention, all of which would have been jeopardized had S—— left New York a few weeks earlier. Any unprincipled man, with a small amount of mechanical knowledge, can, by swearing to 'a communication from a foreigner residing abroad,' obtain a patent, unless he is met on the threshold by an opposition which will compel him to show the nature of the communication under which he attempts to procure it.

"I forward the preceding extracts and remarks for publication in your Journal, should you think proper so to dispose of them."

The writer of the letter from England probably is not aware of the difference between the practice here, and there, in the issuing of patents. In England the patent issues upon the title of the invention being furnished, and several months are allowed, most commonly six, for the enrolling of the specification, so that no individual can learn the nature of the invention at the patent office, for this length of time after it has been *secured*. In the United States the specification must be furnished before the patent can issue, and the very day that a patentee receives it, any one may obtain a copy of it. The office has no power whatever to refuse such a copy, and no blame therefore, attaches there, this being the fair construction of the law. The only safe procedure, therefore, when an inventor wishes to secure a patent in England, is to send over prior to, or simultaneously with, his application here, furnishing to a proper agent, a copy of his specification and drawings, and the necessary funds, otherwise he is likely to be superseded, in which case he has no remedy.

There are but few cases, however, in which an inventor ought to rely upon his own judgment respecting the propriety of obtaining a patent in England; he should obtain the best advice here, and after this be careful that the business goes into the hands of an agent there who has the ability, and the integrity to direct him aright. An english patent costs about six hundred dollars, for that kingdom alone, and if extended to Scotland and Ireland, about three times that amount. Were all inventions as good as their authors think them, this sum would be one of little comparative moment; but, in point of fact, there is not more than one in fifty of the patents obtained here, which would be worth patenting in England, at so great a cost, although what is really new and useful will, in general, be better paid for there, than with us.

ENGLISH PATENTS.

To Robert W. Siever, *for an improvement or improvements in the making or manufacturing of Elastic Goods or Fabrics, applicable to various useful purposes. Sealed January* 17, 1833.

This invention is described by the patentee in the following manner:—

My invention of an improvement or improvements in the making or manufacturing of elastic goods, or fabrics, applicable to various useful purposes, are designed for the production of an elastic web, cloth, or other manufactured fabric, for bandages, and for such articles of dress as the same may be applicable to.

The first object which I propose, is to manufacture an article by the ordinary knitting frame, or similar kind of machinery, in which cords or strands of Indian rubber shall be introduced between the loops or stitches of the fabric, for the purpose of forming elastic cords or bands round the margins or other parts of stockings, socks, gloves, nightcaps, drawers, and various other articles of clothing. The second object is to manufacture in the ordinary loom an elastic woollen cloth, by the introduction of cords or strands of India rubber among the longitudinal threads or yarns which constitute the chain or warp, and also among the transverse threads or yarns, which constitute the weft or shoot, and which cloth shall be capable of being afterwards felted and dressed with a nap. The third object is to produce cloth from cotton, flax, or other suitable material not capable of felting, in which shall be interwoven elastic cords or strands of Indian rubber, coated or wound round with a filamentous material.

The first of these improvements I effect by preparing knitting frames, or other similar machines, in the usual way for the production of the knitted materials called stocking fabric; and when the same are set to work, and the fabric has been manufactured by the ordinary knitting process up to the part at which I desire to introduce the elastic cord or strands, I then, by the adjusting screws of the machine, provide for the elongation or contraction of the lengths of the loops or stitches of the row next to be produced across the machine, in order to form a channel to receive the said elastic cord or strand; and having prepared fine strips of Indian rubber, which may, if desired, be coated, or covered, with a filamentous material, as described in the specification of my patent, dated the first day of December, 1831, and enrolled in the Office of the Rolls Chapel of the High Court of Chancery, in June, 1832, I conduct such thread, cord, strand, or strip, of Indian rubber by means of a long needle, hook, pincers, or other suitable apparatus answering the purpose of a shuttle, across the machine between the row of stitches or loops which were last made, and those which are then about to be formed; and having drawn the said Indian rubber thread, cord, or strand, straight and smooth, I complete the last mentioned row of loops, or stitches, by the ordinary movements of the machine which encloses the Indian

rubber thread, cord, or strand, and keeps it securely in its place, interwoven with the threads of the fabric. A second thread of Indian rubber is in like manner introduced between the next or other subsequent row of stitches, and is in the same way confined; and any further number of these threads, cords, or strands, may, by the same means, be inserted and interwoven into the fabric at such parts as may be required for the purpose of producing (when the selvages are connected or whipped together) elastic bandages, garters, or bracings round the stocking, sock, glove, nightcap, or other article of wearing apparel.

In effecting the second improvement, the production of an elastic woollen cloth, I introduce into the loom among the longitudinal or warp threads or yarns of the intended fabric, longitudinal threads, cords, or strands of Indian rubber, or I constitute the warp entirely of such strands, either covered with a filamentous material or not, as before described; and through, or between the warp threads, cords, or strands of warp, I pass the transverse weft or shoot threads or yarns in the ordinary way of weaving, for the purpose of effecting that intervention which produces the cloth; these transverse weft threads being composed in part of the Indian rubber strands, or of the ordinary threads or yarns of the fabric, according as I may wish to produce a cloth which shall be elastic lengthwise only, or in both directions.

If the elastic cloth so produced should be intended for outward garments with a nap upon its surface, I should employ, in connexion with the India rubber strands, yarns spun from short wool, which, after having been woven, I should finish as the woollen cloths are usually finished, that is, felt the wool in the fulling stock, raise the pile by gig machinery, or by hand cards or teazles, and afterwards shear the nap down to a fine smooth surface. In manufacturing an elastic cloth from cotton, flax, or other material which is not intended to be milled or fulled, I introduce into the fabric threads or strands of Indian rubber, which have been previously covered by winding filaments tightly round them through the agency of an ordinary covering machine, or otherwise; these strands of Indian rubber being applied as warp or weft, or as both, according to the direction of the elasticity required. By thus combining the strands of Indian rubber with yarns of cotton, flax, or other non-elastic material, I am enabled to produce a cloth which shall afford any required degree of elastic pressure, according to the proportions of the elastic and non-elastic material.

It remains only to add, that the strands of Indian rubber are, in the first instance, stretched to their utmost tension, and rendered non-elastic, as described in my former specification; and being in that state introduced in the fabric, they acquire their elasticity by the application of heat after the fabric is made.

Lastly, as my invention consists solely in the employment of strands of Indian rubber in connexion with yarns, in the way described for manufacturing elastic goods or fabrics, I have not deemed it necessary to describe any particular kind of machinery for carry-

ing the same into effect, as such machinery is well known, and forms no part of my invention. [*Lond. Jour.*

To John O. N. Rutter, *Wine Merchant, for his invention of an improved process for generating heat, applicable to the heating of boilers and retorts, and to other purposes for which heat is required. Sealed March* 30, 1833.

The subject of this patent is the employment of bituminous, resinous, or oily matters in connexion with water as a combustible material, which, it is said, will produce a fuel for furnaces, boilers, &c., capable of giving out a very intense heat. Strange as the suggestion of applying water as a combustible material may appear, it is reported to have been found extremely advantageous, economical, and convenient. We, of our own knowledge, can say nothing upon the subject, but merely give the patentee's views and recommendations in reference to the manner in which he proposes to employ those materials for the production of heat.

Bituminous, oleaginous, resinous, waxy, or fatty substances are to be employed: as coal tar, which is to be combined with water in certain proportions. It is proposed that a stream of coal tar shall be allowed to flow from a reservoir through a pipe with a stop cock, and likewise a stream of water from another reservoir through a similar pipe; that the two streams shall meet, and fall into one general receiver with a funnel tube, by which they may be together delivered into the furnace.

The proportions are recommended to be one gallon of coal tar to one gallon and a half of water, the flow of the two liquors to be regulated by suitable apertures or stop cocks. These quantities of materials are to be slowly discharged from the funnels that the whole shall occupy from two to three hours in its delivery into the furnace; and where the furnace is of such magnitude as to require it, several of these funnel tubes may be employed, each delivering its supply of materials in the proportions and times stated.

It is not necessary to use water in a pure state, to be mixed with the coal tar, as foul water will answer the purpose equally well; and on shipboard, where the invention may be usefully applied to steam navigation, the bilge water from below, or sea water, may be pumped up and employed for the purpose, and on land the ammoniacal liquor from gas works will also suit as well as fresh water. [*Ibid.*

To Andrew Ure, *M. D., for his invention of an improved apparatus for evaporating sirops and saccharine juices, which is also applicable to other purposes. Sealed June* 20, 1832.

I, the said Andrew Ure, do hereby declare the nature of my said invention for evaporating sirops and saccharine juices, which is applicable also to other purposes, to be a chemical apparatus, wherein

certain chemical menstrua are made to serve as agents for regulating and modifying the operation of caloric or heat upon various forms of matter, and whereby the influence of high temperatures on these forms of matter may be obtained in definite degrees without the accidents and dangers to which steam and oil as media of heat are liable. This combination of chemical menstrua, with suitable vessels for containing and applying them, I denominate my improved apparatus.

First, I fix one pan within another, so as to leave an intermediate space between the two pans, into which space I put my hot bath liquid medium, consisting of a strong solution of caustic potash, or caustic soda, or of a mixture of these two alkalies. The purer the said simple or compound alkaline solution is, so much the better, but it will form a good calorific medium though it may contain a little carbonated alkali, neutra-saline matter, or other impurity. When the inner pan has the surface of its bottom, or of its bottom and sides, amplified by corrugation with angular or curvilinear ridges and furrows, it constitutes the form of the double pan apparatus, which I prefer for evaporating sirops, saccharine juices, and, in general, all liquids which require to be heated under a regulated temperature, or are injured by exposure in a single pan to the heat of a naked fire.

A double pan of this kind, covered with a proper capital, will constitute an excellent alembic for the distillation of fermented worts or wash, especially those containing rye. The bath space of the said double pan should be provided with a safety tube for discharging any redundant steam which may occasionally proceed from the medium by undue firing. The upper extremity of this tube should terminate in a water trap, or water valve, so as to cut off the open communication between the bath and the atmosphere, because the carbonic acid in the air would eventually carbonate the alkaline solution, and impair its properties as a liquid bath medium.

To each double bath pan I attach one or more thermometers, having their bulbs plunged into the medium, in order to show its temperature; and as the boiling temperature of the alkaline solution depends upon its states of dilution, I regulate that temperature by introducing a little water into the bottom, or centre, of the bath, (through a perforated hole) plunged into it, and connected at its top with a funnel or cistern of any kind.

To insure permanency to the constitution of the alkaline bath, the water valve, or water trap cistern, attached to the end of the safety pipe above specified, should be charged with water mixed with lime, kept in a milky state by occasional agitation.

The said medium may also be applied to evaporation, to oven heating, and to other purposes where a definite temperature is wanted, by heating the alkaline solution in a separate vessel, and causing it to circulate through tubes or cases, of any suitable form, for the communication and distribution of the calorific energy.

The said separate vessel should be connected with a safety pipe, and furnished with a thermometer, and with a tube for supplying water of dilution when needed to regulate the temperature.

I also propose, in certain cases, to employ sulphuric or phosphoric acid, either alone or mixed, as hot bath mediums, the vessel and conduits containing these liquid acids being made of a substance not corrodible by them, and furnished with safety tubes, thermometers, and water supplying pipes for dilution.

I claim as my invention, 1st. the application of a strong solution of caustic alkali, as a bath to an evaporating pan or still, with a corrugated bottom; 2nd. I claim the use for the said alkaline caloric medium of a water trap cistern charged with milk of lime, attached to the end of the safety steam pipe; 3d. I claim the application of the said alkaline solution, either as a bath to the external surface of a plain pan, or as conducted from a boiler through pipes and conduits, in order to apply regulated heat to various purposes; 4th. I claim the application of sulphuric and phosphoric acids, or mixtures of them, as baths or mediums for transmitting heat at definite temperatures.

[*Ibid.*

Specification of the Patent granted to FRANCOIS C. JACQUEMART, *Esquire, for Improvements in Tanning certain descriptions of Skins. Communicated by a certain Foreigner residing abroad. Sealed October* 20, 1830.*

To all to whom these presents shall come, &c. &c. Now know ye, that in compliance with said proviso, I, the said Francois Constant Jacquemart, do hereby describe the manner in which my said invention is to be performed by the following description thereof, that is to say:—

The invention relates to the manner of tanning, preparing, and dressing hares, cats, rabbits, and sea rats' skins, and rendering them fit, through the medium of various preparations mentioned hereafter, to make boots, shoes, gloves, and any other leather goods, little if any advantage having hitherto been obtained from hares, cats, rabbits', and other small skins. All those skins were nearly or entirely lost for the leather trade, since, having cut the hair off, they were only used to make glue or other similar purposes. Having examined the nature of such skins, and submitted them to certain preparations, the inventor has succeeded, after many attempts, to give them the necessary strength and consistency, in such a way as to employ them with advantage in making boots, shoes, gloves, and other leather goods.

First, I proceed as follows: Take the skins; lay them open; pull off the long hair; rub them with mercurial aquafortis, and put them into a heat of about forty-five or fifty degrees by Reaumur's thermometer. I then cut the hair off, and then take these skins stript of their hair, lay them in the tan preparations. When they have been

* An abstract of this specification was given in a former number; it is now published entire, and however good the process may be, the description is certainlly a very bad one.

dried so high as forty-five or fifty degrees, in order to bring them again in their natural state, I put them into salt water mixed with blood for about six or seven days. Afterwards take them out of it, to put them into a water mixed with blood in the proportion of about one-tenth part of blood to nine-tenth parts of water, to get the salt out, and deaden or render them supple. Remove them from that ley, and put them into a dead lime water, to cause them to swell or thicken, and put them again for three days into a lime water stronger than the former, to obtain a greater swelling or thickening. To succeed in it, I take one pound of salt pot-ash and eight ounces of orpiment, that I melt together for one hundred skins. Then I throw them into a lime bath about one-fifth stronger than the former ones, and leave the whole for twenty-four hours; after which the hair will drop off perfectly.

Manner of tanning the same skins.—I take away the hair from them, and remove the loose flesh. I have a set of tubs placed upon each other; I fill them with tan; wash them in ley, in order to get the clear liquid out springing from the tan. I then lay upon each tub about one pound of sulphuric acid. When this liquid has reached four degrees in strength, I take out the skins every other day, change them, and replace them in the same liquid till they are nearly tanned. Then I lay the skins in the pit for about one month, after which the skins become much stronger. The currying of them is done like that of other skins, and those reserved for glove making are dressed in the same manner as the white skins for that use.

Second process.—I take the skins, lay them open, pull off the long hair, steep them in a bucket of clear water, and give them the first dressing. I put them again in the same water during twenty-four hours, take some lime, infuse it, and add to it, for one hundred skins, four ounces of orpiment, which I mix with the lime. I then lay some lime upon each, on the side of the flesh, to make the hair drop off, and pick or remove the loose flesh off; on the fleshy side, in a contrary way to the grain of the hair, to get off the inner skin. I put them then into a new lime water; add to this lime water, for one hundred skins, two pounds of alum, and one pound of salt pot-ash, the whole dissolved together. I let the skins remain in the lime-water for the space of eight days; take them out of the lime-water, and dress them every day; wash them thoroughly, put them into a vessel with the tan, and stir or agitate them four or five hours every day; let them remain therein about five or six days. Afterwards, I put them into a vessel with new tan, and add to it, for one hundred skins, eight ounces of sulphuric acid. I let them remain in this fresh vessel a necessary time to get the strength and thickness which are wanted, which is obtained in about twenty-four or thirty hours. I take them out of it, put them into a tan-pit or vessel, and lay some tan between the skins in order to soak them. I take the liquid out of the tan, and mix with it, for one hundred skins, one pound of alum. I let them remain thus for eight days; take them out of it, and lay them in the pit, and let them remain there about a month. I again take them out of it, and curry them like the other skins. The skins

for glove-making are dressed in the same manner as the white skins for that use.

My manner of tanning, preparing, and dressing these skins as fur-skins, so that the hair may not fall off, or the moth or mite get into them (these leather furs being thick, strong, and supple, may be employed in making boots, shoes, gloves, and other articles,) and have not besides the inconvenience of the furs called untanned furs. I take the skins, lay them open, pull off the long hair, steep them afterwards in clean water; at the end of twenty-four hours give them the first dressing; put them again into the same clean water for twenty-four hours; take one pound of alum for twenty-five skins; melt it in lukewarm water, and pour that water into a bucket. Then I take the skins, one by one, and dip them in the same water of alum. Let them remain in it for two days afterwards; melt some quick lime in water, and let it get cool. I then take the skins out of the water of alum, and put them into this quick-lime water. Five or six days afterwards I take them out of the lime-water, put them into clean water, and immediately wash them thoroughly. I then tan, curry, or chamois them in the way before described.—*Rep. Pat. Inv.*

¶ *Statistics of French Manufacturers.*

"The principal manufactures of France may be dated from the reign of Louis XIV., whose minister, the celebrated Colbert, invited foreign artists and artisans of every kind and of distinguished merit into the kingdom, and encouraged them by premiums to fix their establishments in France. But towards the end of his reign, that monarch, by his revocation of the Edict of Nantes, and his persecution of the Protestants, in a great measure destroyed the advantages arising from the foreign establishments, by forcing thousands of artisans to seek refuge in England and the Low Countries, into which they introduced those branches of industry, especially silk. Thus France lost the services of some of her most ingenious mechanics through the folly of an infatuated monarch.

"To give an idea of the manufactories of France, it is sufficient to cite the draperies of Louviers, Sedan, Elbeuf, Castres; the cambrics of Valenciennes and Cambray; the pier-glasses of St. Gobain, whose dimensions are occasionally ten feet in height by four and five feet broad; the cotton manufactories of St. Quentin, Rouen, &c. &c.; the linens of Brittany, Dauphiny, and the northern provinces; the laces of Lille, Alençon, Valenciennes, and Puy; the silks of Lyons, Avignon, Nîmes and Tours; the tapestries of the Gobelins, at Paris; the carpets of La Savonnerie and Aubusson, which, in beauty of design and brilliancy of colours, rival those of the east; the porcelain of Sevres, her manufactories of clocks and watches, jewellery, crystal, mock diamonds, bronzes, fire-arms, &c. To these might be added an immense number of manufactories which were wholly unknown in France half a century ago, such as files, needles, wool-cards, &c.

"We have learned from official sources, that the capital employed

in manufactures amounts to 1,820,105,409 fr., which is applied as follows:—

In indigenous materials	416,000,000 fr.
In materials imported	186,000,000
In wages	844,000,000
In general expenses, as wear and tear of machinery and tools, repairs, fuel, lights, interest of money invested as fixed capital, which being deducted from the gross amount, leaves 182,105.409 fr. for the profit of the manufacturers . .	192,000,000

"The annual produce of the principal branches of industry in 1828 has been calculated in round numbers as follows:—

Thrown silks, silk stuffs, gauzes and crapes .	160,000,000 fr.
Cloths and woollen stuffs	250,000,000
Linen drapery and thread lace . .	210.000,000
Stationary	25,000,000
Cotton	200,000,000
Lace	10,000,000
Hardware	125,000,000
Coal and other produce of mines and quarries	30.000,000
Watches and clocks	30,000,000
Gold and Silver articles . . .	50,000,000
Jewellery	40,000,000
Glass, plate glass, china, pottery, bricks .	80,000,000
Lime and plaster	15,000,000
Salts and acids	30,000,000
Soap	30,000,000
Refined Sugar	15,000,000
Hats	30,000,000
Leather	160,000,000
Dye and varnish	50,000,000
Perfumery	15,000,000
Books	30,000,000
Beer	60,000,000
Cider and perry	50,000,000
Brandy	75,000,000
Upholstery and musical instruments .	50,000,000
Total,	1,820,000,000 fr.

"Having enumerated the principal manufactures in France, we shall state from official information the progress made in the productions of those manufactories from 1812 to 1827. In the first place, we find that under the government of the empire, when Belgium and the left bank of the Rhine were under her dominion, France in 1812 employed in her manufactories 35 millions kilogrammes, or 70 million lbs. of native wool. In 1816, the quantity of native wool, with the amount imported of foreign wool for fine cloths, merinos, and cachemires, &c., was in the whole 80 million French pounds, which, with the difference of nearly ten per cent,, is equal to 90 million lbs,

English. In 1824 and 1826, the quantity of wool used in the manufactories amounted to 48 millions of kilogrammes, making an increase in the consumption of wool, in fourteen years, of 26 millions of French pounds, or more than one million English tod.

"In 1812, the quantity of cotton spun into thread did not exceed 10,362,000 kilogrammes. The consumption in 1816 amounted to 12 millions of kilogrammes; in 1825, the quantity manufactured was 26 millions; in 1826, 32 million kilogrammes of cotton employed in prints, calicoes, tulles, &c.: thus the consumption has been more than tripled in fourteen years. The consumption of silk has not less increased, in proportion to wool and cotton. In 1816, France imported 400,000 kilogrammes of silk; in 1824 and 1825, 650,000 kilogrammes; and in 1826, not less than 800,000 kilogrammes, notwithstanding the progress made and encouragement given to breeding of silk-worms in the country. In 1816, the quantity of coals extracted from the mines did not exceed 1000 million kilogrammes; in 1826, they furnished 1500 million kilogrammes. In 1814 and 1816, the quantity of iron manufactured amounted to 100 millions, and in 1825 and 1826, it had increased to 160 millions of kilogrammes."—[*Goldsmith's Statistics of France, and Rep. Pat. Inv.*

¶ *Correct Fusing Points of Metals and Alloys, and other important temperatures upon various Thermometrical Scales.*

In the thirteenth edition of Parke's Chemical Catechism, edited by Mr. Braley, jr., which has just appeared, we find a "Table of the Effects of Heat" (p. 606,) in which the higher temperatures have been corrected by the Editor, agreeably to the pyrometric researches of Mr. Daniell and other chemists. As we do not remember to have seen any connected view of the results, as to the correct fusing points of metals and alloys, &c., which Mr. Daniell has obtained by the use of his new register pyrometer, we subjoin an extract from this table, containing the temperatures from 212° upwards. It may be requisite to state, for the information of such of our readers as may not be acquainted with the present state of pyrometry, that Mr. Daniell has shown (as we find it explained by Mr. Braley at p. 70, *notes*, of the Chemical Catechism,) that "the degrees (above the zero of 1077° Fahrenheit, which is stated to be a red heat visible in the daylight,) of Wedgwood's pyrometer, instead of being equal to 130° of Fahrenheit, as supposed by its inventor, are equal only to about 20°;" and that consequently the *range* of that instrument, instead of including 3200 degrees of Fahrenheit, did not really include more than about 5000°: this will account for the great difference of the corresponding temperatures of Fahrenheit, &c. and Wedgwood, as here stated from the new edition of the Chemical Catechism, from those given in former editions of that work, and also in many other publications on chemical subjects.

Fusing Points, &c. on the Scales of	Fahr.	Reaum.	Cent.	Wedg.
Water boils, and 'fusible metal' [$\frac{8}{16}$ bismuth, $\frac{5}{16}$ lead, $\frac{3}{16}$ tin, melts,]	212	80	100	
Sulphur melts	216	89	111	
Nitrous acid boils	242	93	116	
Camphor melts	288	114	142	
Sulphur burns slowly	303	120	150	
Pewter melts, lead $\frac{4}{5}$, tin $\frac{1}{5}$	403	165	206	
Tin melts	442	182	227	
Type metal melts, (lead 16 parts, antimony 1)	507	211	264	
Sulphuric acid (Sp. gr. 1.848) boils	590	248	310	
Lead melts	612	258	325	
Mercury boils	662	280	350	
Zinc melts	773	329	412	
Iron a bright red in the dark Hydrogen gas burns?	800	341	427	
Iron red in the twilight	884	386	475	
—— red heat in daylight	1272	551	700	
Enamel colours *burnt or burnt in*,* on porcelain	1392	605	756	6
Bronze melts, copper $\frac{3}{4}$, tin $\frac{1}{4}$	1446	629	786	
————, copper $\frac{7}{8}$, tin $\frac{1}{8}$	1534	668	835	
Diamond burns?	1552	676	845	14
'Orange heat' (Prinsep)	1650	719	899	
Brass melts, copper $\frac{1}{2}$, zinc $\frac{1}{2}$	1672	730	911	
————, copper $\frac{3}{4}$, zinc $\frac{1}{4}$	1690	737	921	21
Bronze melts, copper $\frac{15}{16}$, tin $\frac{1}{16}$	1750	794	955	
Silver melts	1873	818	1023	28
Copper melts	1996	862	1091	
Gold melts	2017	860	1102	
Delft ware fired	2072	967	1179	40
Cast iron melts	2786	1224	1420	
Cream coloured stone ware fired	2992	1316	1645	86
Temperature of the maximum of expansion of platinum, being nearly the highest degree of heat attainable in a laboratory wind furnace	3280	1444	1805	
Flint glass furnace, greatest heat?	3552	1253	1956	114
Soft iron melts, according to Clement and Desormes, but in all probability an estimate considerably above the truth	3945	1406	2118	

* This is a technical term used by enamellers, glass and porcelain painters, &c., to denote the fixing of the colours they employ, by means of vitrifaction, on the substances painted upon.

Mr. Braley observes at the end of the table, "The still higher temperatures, derived from the experiments of Mr. Wedgwood, which were here given in former editions of the Chemical Catechism, are now omitted; a comparison of them with the results obtained by Mr. Daniell, by means of his pyrometer, having shown that they cannot be relied upon. Some of the temperatures given in this table above that of ignition, or 800°, must also be regarded as doubtful, and all of them must be regarded as approximate merely.

[*Rep. Pat. Inv.*

Attempt to assign the cause of the Spontaneous Combustion of Charcoal. By Mr. John Davies. *Member of the Wernerian Society of Edinburgh, &c. and Lecturer on Chemistry, &c.*

In the above interesting paper*, no attempt has been made by the author of it to furnish an explanation of the phenomenon which he has established and described: and as every inquiring mind will direct its attention to a rationale of the operation, I presume that some remarks which have occurred to me within the few last days, and which may at least supply some aid in the discussion, may be, without impropriety, appended to the paper. These remarks, though theoretical, are countenanced by experimental analogies, which, if they fail to establish the accuracy of the speculation, may at least excuse its introduction.

A statement of the mode in which the charcoal in question is made, will be necessary in the subsequent explanation. Small fragments of wood, generally stripped of their bark, are put into iron cylinders, and exposed to intense heat in order to effect the distillation of the volatile constituents for the manufacture of iron liquor. Now, Mr. Brunner resorted to a similar procedure in obtaining potassium from potash and charcoal; and as we know that potash may be procured from the wood employed by Mr. Hadfield, we have in his manufacture the same operation and the same materials as in M. Brunner's experiment, and may therefore expect the same results. The only difference would be, that as M. Brunner used much potash, he procured a large proportion of the metallic base; while in the other case the potassium must be in small quantity, because all the potash present would be only that supplied by the wood subjected to distillation: and yet, upon the whole, the quantity extracted under the latter circumstances is not inconsiderable; for it is by the combustion of such wood in America, where it is of comparatively little value, that the potash is principally formed which is consumed in the arts and manufactures in every part of Europe.

It is manifest, therefore, that in the formation of Mr. Hadfield's charcoal, potassium must, in small quantities, be liberated.

Supposing the presence of potassium in fresh charcoal to have been

* See page 208 of this Journal.

established, we have now to explain its operation; and this appears to be effected upon the assumption that the metal lingers in the pores of the charcoal, incased, as it were, in the substance, until it be at length exposed to the action of atmospheric air and aqueous vapour. This view of the subject derives plausibility from the facts, that the combustion does not commence at any considerable depth below the surface; and that when a thermometer is introduced into the mass, the ignition generally originates in that place; that is to say, the combustion occurs exactly where it might be expected, since it takes place at the part which, favourably situated, is most exposed to the action of the supporter of combustion.

This general view of the spontaneous combustion is directly countenanced by the excellent paper of Colonel Aubert, inserted in the 'Bulletin des Sciences Militaires' for January, which Mr. Hadfield has afforded me the opportunity of consulting. This ingenious foreigner shows by a number of decisive experiments, that the absorption of air and moisture is indispensable in the production of the phenomenon.* He proves also, (what Mr. Hadfield has in a different way very clearly confirmed,) that no carbonic acid is formed before the incandescence occurs—a fact strictly in accordance with the hypothesis which I have offered; since upon this hypothesis the oxygen of the air, instead of forming an acid with the carbon, produces, by its superior affinity, an alkali with the potassium. The next position which he establishes, is, that the carbon increased in weight in proportion to the quantity of air and moisture absorbed; and this should, according to the explanation suggested, occur, the alkali formed being much heavier than its metallic base. It appears that, to produce the ignition, the charcoal should not only be reduced to powder soon after its formation, but that the sooner it is so reduced the more certain and considerable will be the effect. Now this fact also is entirely consistent with the explanation; because, when the pulverization has been delayed, air and moisture will have gradually produced the alkali, by a process imperceptible, because, the minute portions of potassium would be at comparatively distant intervals from each other, and thus would not be in sufficient quantity at any one place to produce a sensible effect.

Colonel Aubert pulverized a mixture of charcoal and sulphur, and he found that, under these circumstances, no ignition ever occurred. The reason is obvious: for the potassium which has been conceived to be the cause of the combustion, entered, during the trituration, into combination with the sulphur.

He also triturated charcoal with nitre, and he again found that the spontaneous combustion was prevented. Now nitre, by mingling with the potassium, would check its too rapid absorption of oxygen; and the effect of his experiment is in this way sufficiently accounted for.

The presence of the potassium seems to account for the circumstance, that when charcoal is moistened and subjected to heat, car-

* See Phil. Mag. and Annals, N. S. vol. ix. p. 148.

buretted hydrogen is set at liberty. In this instance it would appear that the water is decomposed, the hydrogen evolved, and the oxygen united with the potassium to form the alkali. If the heat be continued, carbonic oxide would be evolved; the oxygen absorbed in the first part of the operation being again detached from the metallic base. Now this explanation corresponds precisely, I believe, with the order in which, in such an experiment, these gases are produced.

All the circumstances observed by Mr. Hadfield and Colonel Aubert appear therefore perfectly reconcileable with the supposition, that the spontaneous incandescence is owing entirely to the oxidation of the potassium liberated from the wood during the manufacture of the charcoal.

Dr. Thompson, in the second volume of his History of Chemistry, published since my paper was read to our Society, has thrown additional plausibility upon my explanation, by his attempt to show that phosphorus owes its property of catching fire, when in contact with oxygen, to a little potassium which is reduced to the metallic state during the formation of the phosphorus. [*Phil. Mag.*

¶ *Composition and specific gravity of different kinds of Glass, and true nature of that substance in general.*

Ordinary flint glass, according to Mr. Faraday's analysis, consists in 100 parts, of silica 51.93, oxide of lead 33.28, potash 13.77, with minute portions of other substances. A specimen of the same kind of glass, manufactured for telescopes by the late M. Guinand, yielded the same chemist, silica 44.3, oxide of lead 43.05, and potash 11.75. Mr. Faraday found the specific gravity of M. Guinand's glass to be about 3.616, that of ordinary flint glass 3.290, that of plate glass 2.5257, and that of crown glass 2.5448.

Glass has usually been considered, without much actual inquiry into the subject, to be strictly a chemical combination of its ingredients, and in all respects a very perfect artificial compound. This, however, is far from being the truth, as will appear from the following facts. That the alkali in common glass of all kinds is in a very imperfect state of combination, many circumstances concur to evince. For example, Mr. Griffiths has shown that if a small quantity either of flint glass or of plate glass be very finely pulverized in an agate mortar, then placed upon a piece of turmeric paper, and moistened with a drop of pure water, strong indications of free alkali will be obtained; and that if the pulverization be very perfect the alkali can be detected in other kinds of glass, containing far smaller quantities of it. This proves that in whatever state of combination the alkali may be, it is still subject to the action of moisture. That flint glass is by no means a compound resulting from very strong chemical affinities, and that the oxide of lead which it contains is as imperfectly combined as the alkali, has been shown experimentally by Mr. Faraday, and also appears from the tarnish which is produced on its

surface by exposure to sulphuretted vapours, owing to the combination of sulphur with the lead. Glass which has long been exposed to the weather, frequently exhibits a beautiful iridescent appearance, and is so far decayed that it may be scratched with the nail. The glass of some bottles of wine which had lain in a wet cellar near the Bank of London upwards of 150 years, examined by Mr. Brande, was soft, and greatly corroded upon the surface, in consequence of the partial abstraction of the alkali. After reciting some of these facts, and others of a similar description, Mr. Faraday observes,—"Glass may be considered rather as a solution of different substances one in another, than as a strong chemical compound; and it owes its power of resisting [chemical] agents generally to its perfectly compact state, and the existence of an insoluble and unchangeable film of silica or highly silicated matter upon its surface.—*Parke's Chemical Catechism by Braley*, p. 128, 127. [*Rep. Pat. Inv.*

¶ *Iron Stone of Sussex.*

This substance was formerly extracted from the ferruginous sand stone strata; it is internally of a dark steel gray, and generally very hard and compact; occasionally it is laminated, and separates into thin flakes upon exposure to the air. It occurs either in irregular concretions in the sand (of the Hastings' Sand formation of geologists, formerly called the Iron Sand,) or it is stratified and alternates with beds of sand stone. The globular masses often contain nodules of argillaceous earth, round which the iron stone is disposed in concentric layers. In some parts of the county the iron stone is of excellent quality, and extensive foundries were anciently established in different parts of its course; 'the almost inexhaustible quantity of wood,' we are informed in Dallaway's Western Sussex, 'with which the country was covered in the early centuries, and the numerous lakes and morasses which the total neglect of drainage had occasioned, being circumstances peculiarly favourable for the conversion of the iron ore into bars. For this purpose the lords of the several manors which lay within the woodland district, collected the rivulets into large ponds, and erected mills and furnaces. The iron so procured, was at first principally used for agricultural implements; but Fuller also observes in his Worthies, that 'it is almost incredible how many great guns were made of the iron of this county.' The total decline of the manufacture in Sussex is to be attributed to the establishments in Scotland and Wales, in which pit coal is used, the superior cheapness of fuel having enabled them to monopolize the trade. There is now but a single foundry in the eastern division, and which belongs to the Earl of Ashburnham. According to the present practice it requires fifty loads of charcoal, and fifty loads of iron stone, (twelve bushels to each load,) to make thirteen tons of pig iron.—*Mantell's Geology of the South East of England.*

[*Ibid.*

¶ *Force of Traction.*

Experiments uniformly show, that the force of traction is, in every case, nearly in an exact proportion to the strength and hardness of a road. The following are the results: on a well-made pavement, the power required to draw a wagon is 33 lbs., on a road made with six inches of broken stone of great hardness, laid on a foundation of large stones, set in the form of a pavement, is 46 lbs.; on a road made with a thick coating of broken stone, laid on earth, the power required is 65 lbs.; and on a road made with a thick coating of gravel, laid on earth, the power required is 147 lbs.—Thus it appears, that the results of actual experiments fully correspond with those deduced from the laws of science."

[*Parnell's Treatise on Roads.*

CELESTIAL PHENOMENA, FOR JUNE, 1834.

Calculated by S. C. Walker.

D.	H.	M.	S.						
5	3			☿	☌	ε Geminor ✱		North	44′
18	16	34		♀	☌	☾ ♀		North	1′
12	0			♀	☌	δ Geminor ✱		South	1°.7
8	16	26	58.2	Im.	♃	2 Sat.			
12	14	21	56.2	Im.	♃	1 Sat.			
19	16	16	09.2	Im.	♃	1 Sat.			
20	14	39	28.4	Em.	♃	3 Sat.			
27	16	30	40.7	Im.	♃	3 Sat.			
12	9	23		Im.	46 *i*	Leonis,	,6,	N158°	V210°
12	10	4		Em.				236°	288°
16	6	43		Im.	(270)	Virginis	,7,	208°	21°.
16	7	56		Em.				220°	233°
16	11	8		Im.	94	Virginis	,5,	193°	227°
16	11	32		Em.				229°	269°
20	12	7		Im.	5 *i*	Sagittarii	,7,	134°	142°
20	13	17		Em.				242°	260°
20	13	45		Im.	7 *a*	Sagittarii	,6,	136°	159°
20	14	35		Em.				226°	256°
20	14	10		Im.	9	Sagittarii	,6,7,	120°	145°
20	15	18		Em.				242°	277°
20	14	52		Im.	(342)	Sagittarii	,7,	112°	136°
20	16	05		Em.				250°	282°
21	13	10		Im.	(261)	Sagittarii	,6,7,	111°	116°
21	14	30		Em.				253°	273°
21	16	44		Im.	(301)	Sagittarii	,7,	170°	210°
21	17	51		Em.				208°	255°
24	9	17		Im.	*k*	Capricorni	,5,	138°	99°
24	10	17		Em.				246°	215°
27	10	51		Im.	*s*	Piscium	,5,	115°	76°
27	11	54		Em.				303°	261°

The Chinese Wall.

According to a statement in the "Morgenblatt," the celebrated Chinese wall was erected 213 years before the birth of Christ, against the Mongolese. It is 714 German miles long, 14 feet thick, and 26 feet high; so that with the same materials, a wall, one foot in thickness and 23 in height, might be carried twice round the whole world.

Meteorological Observations for March, 1834.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	30°	49°	29.73	29.60	W.	Moderate.		Clear day.
☽	2	32	43	.50	.50	W.	do.		Clear day.
	3	23	29	30.03	30.15	NW.	Blustering		Clear day.
	4	28	45	.15	.10	W.	do.		Clear day.
	5	29	55	.00	.00	W.	Moderate.	0.20	Clear—hazy—rain in the night.
	6	45	52	29.90	29.90	SW.	do.		Cloudy—flying clouds.
	7	40	55	30.15	30.20	SE.	do.		Clear—hazy.
	8	50	64	29 85	29.70	SE. S.	Blustering		Cloudy day.
	9	34	42	30.15	30.25	NW.	do.		Clear day.
⊗	10	25	39	.50	.50	SE.	Moderate.		Clear day.
	11	34	44	.20	.00	W. S.	do.	0.20	Cloudy—drizzle.
	12	40	56	29.80	29.74	W.	Blustering		Clear—flying clouds.
	13	34	46	30.05	30.00	W.	Moderate.		Clear day.
	14	32	50	.10	29.95	SE.	do.	0.30	Lightly cl'dy—clear—rain in n't.
	15	32	42	29.80	.80	N. NE.	do.		Cloudy day.
	16	36	50	30.00	30.05	SE. S.	do.		Clear day.
☾	17	54	54	.05	.05	W.	do.		Clear day.
	18	48	58	.20	.10	E.	do.		Cloudy day.
	19	46	68	.00	29.90	SW.	do.		Clear day.
	20	50	70	29.90	.75	SW.	Brisk.		Clear day.
	21	40	41	.75	.80	W.	do.		Clear—cloudy.
	22	21	31	.93	.96	W.	Blustering		Clear day.
	23	26	42	30.00	.85	W.	Moderate.		Cloudy day.
	24	34	49	29.75	.75	W.	do.		Cloudy—flying clouds.
☺	25	31	41	.85	.60	SE.	do.	0.75	Cloudy—rain.
	26	32	40	.90	.95	W.	do.		Clear—lightly cloudy.
	27	26	51	30.12	30.12	SE.	do		Clear—flying clouds.
	28	30	58	.12	.05	SW.	do.		Clear—flying clouds.
	29	44	64	29.84	29.64	W. S.	Brisk.		Foggy—clear.
	30	24	35	.95	30.00	NW.	do.		Clear day.
☽	31	23	46	30.20	.20	SE. SW.	do.		Clear day.
	Mean	34.61	42.68	29.98	29.94			1.45	

	Thermometer.	Barometer.
Maximum height during the month,	70. on 20th.	30.50 on 10th.
Minimum do.	21. on 22nd.	29.50 on 2nd.
Mean do.	41.64	29.96

JOURNAL

OF THE

FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

JUNE, 1834.

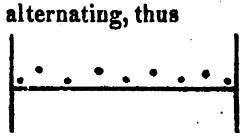
On the Seams, or Joints, of Steam-boilers. By Thomas Ewbank, *of New York city.*

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

To justify inquiry into the minutiæ attending the formation of steam boilers, it is perhaps sufficient to observe that no general rule is adopted by workmen in putting them together; and that human life frequently depends upon the skill and workmanship employed in their construction.

The following remarks are designed to call attention to the seams of boilers, and to show the utility of instituting a series of experiments to determine their relative strength. This will appear the more necessary when it is considered that the strength of boilers has been calculated on the cohesion of the solid part of the sheets or plates, without reference to the seams. The tables of Oliver Evans and others are thus constructed.

In order to unite by rivets two plates of metal in the strongest possible manner, several particulars are necessary to be attended to—as the length and diameter, or thickness, of the rivets—their distance from each other—their distance from the edge of the sheets, or what extent of lap each sheet should have—their direction, whether in a right line, as usual, or alternating, thus



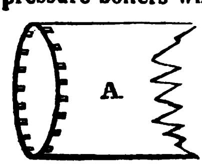
That there is a medium in all these, and some other particulars, the best calculated to secure strength in the seams, cannot be doubted. To determine it by experiment, the only sure way, would be of great practical importance.

The length and thickness of rivets, and other particulars relating to them, will depend upon the thickness of the plates they are intended to unite. In working thin sheet iron (when the effects of riveting are easily perceived,) with cold rivets, a good joint cannot be made, if they are either too long or too thick. In the former case the heads of the rivets are liable to burst, and in the latter, the holes to be enlarged. When too long, they also become hardened by hammering, and are liable to break. In forming steam boilers, the rivets are heated, and the plates being thick these results are not so obvious; yet they are sure to be produced in proportion as these causes are suffered to exist.

Supposing the average thickness of rivets to be .625 inch, and that of the plates .25, can the size of the rivets be reduced without injury to the joint? Or, would those of smaller dimensions, and an increased number of them, be preferable? It would seem that they should be sufficiently strong to endure a strain equal to the cohesive force of the plates at the joint, and *no more;* for if their thickness be unnecessarily enlarged, the strength of the plates will, in the same ratio, be diminished, by the extra portion of their substance punched out.

Another inquiry is, What is the proper distance of the rivets from each other? This is evidently important, because the strength of the plates on the line of the joints, is inversely as the number of the holes, or their sum collectively. Admitting the rivets to be half an inch in thickness, and the distance between each one inch (a common proportion) the strength of the plates at the joints is reduced *one-third* below that of the body of the plates:—or, taking the proportions in the boilers of the New England as the average, it is still further reduced, the holes being .625, and the distance between each 1.125. Hence it would appear that no joint can be so strong as the body of the plates. And from all calculations on the strength of boilers predicated on the tenacity of the metal, full one-third should be subtracted; that amount at least being always punched out in every joint for the rivets.

The distance of the rivets from the edge of the plates should also be determined. The holes for them should be made at such a distance that the texture of the metal between them and the edge should not be disturbed. Is there not some danger in this respect when they are but three-eighths of an inch from it? I have noticed some high pressure boilers where the rivets that secured the ends of them were less than that distance from the edge. In such cases it appears very possible for those ends to be blown out, in consequence of the small portion of metal opposite each rivet giving way, as at A.



It appears to me that in all joints or seams, the

centre of the holes should never be nearer the edge of the plates than twice the diameter of the rivets. This point, however, can only be satisfactorily determined by experiment.

Every one acquainted with the working of sheet iron is aware, that it is frequently formed of layers, or strata, which are imperfectly united, so that in punching a hole, or in cutting the edges, the space between the layers is often opened and made visible, which is another reason why the plates should lap over each other to the extent indicated. On this account, iron boilers require more lap than copper ones, the latter metal not being so subject to those defects.

Remarks on the Height of the Aurora Borealis, with a review of the accounts of some of the most remarkable Auroral Arches. By James P. Espy.

[Continued from p. 182.]

I might here terminate the discussion, as I have shown most conclusively that the auroral arches which have been the subject of this investigation, were not five miles high, and probably not more than two; but I shall adduce other proofs which will be satisfactory to those who may not choose to follow me in the preceding investigation. And first I shall give an account of a splendid aurora borealis as seen at the observatory of Gosport on the 7th of January, 1831.

In the afternoon of this day, there was a peculiar brightness in the atmosphere near the horizon, for several degrees on each side of the true north point which indicated the approach of an aurora; indeed, we have reason to suspect that it was a faint appearance of one; while the sun shone in all his splendour, without the interposition of cloud or vapour. Shortly after sunset an aurora borealis gradually rose above the northern horizon, and at a quarter past five o'clock it had assumed the form of an arch of refulgent light, ten degrees in height, and seventy degrees in width. From this time till half past five it continued to increase in the intensity of its light, expanding to the western point of the horizon, and fifty degrees to the eastward of north, which made the chord of the aurora 150°. Now, a bright *flame-coloured* rainbow-like arch, between three and four degrees broad, and pretty well defined at its upper edge, emanated from the curved edge of the aurora to an altitude of thirty-five degrees; and while it remained apparently stationary, a beautiful rainbow-like arch, still more brilliant, formed about ten degrees south of the zenith, by streamers suddenly springing up from the N.E. by E. and W. by S. points of the horizon, and meeting in the zenith, so that these two bows presented themselves at the same time. At thirty-five minutes past five, the latter bow, in some parts four and in others six degrees in width, divided a little to the eastward of the vertex; and the long streamers which formed it passed off gently to the southward in very bright patches, two in the south-east and one in the south-west quarters, like

luminous clouds, and continued in sight nearly a quarter of an hour. One of these bright patches nearly covered Orion several minutes. At forty minutes past five another rainbow-like arch, equally wide and bright, was formed by long streamers from about the same points of the horizon, whose point of convergence was the same, and its course through the feet of Gemini, near the Pleiads, through Aries, the Square of Pegasus, the head of Equulus, and the Bow of Antinous. It passed off gradually towards the south, and at a quarter before six, the planet Mars, then near the meridian, and about forty-five degrees in altitude, rested, as it were, conspicuously on it. At six, it had gone far towards the southern horizon, and could scarcely be perceived, leaving the sky unusually clear and bright. By this time the bow over the aurora had much increased in altitude, and was nearly effaced.

At a few minutes past six, after a great many coloured columns of light had risen from the north-east and north-west quarters, and passed the zenith, the aurora sunk considerably towards the horizon, but its upper edge remained bright and very well defined. Some of the streamers, or columns, were long, others short, and the widest generally remained long enough to pass through a gradation of prismatic colours. At half past six the aurora again increased in altitude, and vivid coruscations radiated from every part of its arch, and on intermixing with each other, formed wide columns which were so grand, with crimson tints, as to astonish every spectator. Between seven and eight, the aurora had spread at least two-thirds over the heavens, and as far as the shoulders of Orion on the eastern side of the meridian, where large perpendicular columns, and short pointed luminous coruscations, rising from the aurora, glittering like spears and conical points in nearly parallel rows, now mixing, and then dividing, all passed through red, orange, lake, crimson, green, and purple tints; so that the appearance altogether, over so great an extent of the heavens, was exceedingly grand, particularly when contrasted with the cerulean sky, and its spangled constellations, in the southern portion of the hemisphere. At ten minutes before eight the aurora was in its greatest splendour. At five minutes before eight, another luminous rainbow-like arch, stretched across the heavens from the eastern point of the horizon, and displayed several prismatic colours while passing southward. Soon after eight, a large dark space, in, and near, the horizon, presented itself several degrees on each side of the magnetic north, and the aurora, still far over the heavens, gradually diminished. At nine, it again ascended, and wide columns rose from every part of its arch, and passed through the same colours as before mentioned. Between nine and ten the magnetic needle, which in the early part of the evening stood at twenty-four degrees west of the true north, was disturbed, and receded upwards of half a degree northward, either by the influence of the aurora, or by a change of wind from north-east to south-west, and of course a change in its electrical state. At a quarter before eleven there was a grand display of about twelve or fourteen glowing columns from the aurora, several of which passed beyond the

zenith, when a perfect, red, rainbow-like arch, ten degrees above the aurora, was visible. At eleven, another bow, three degrees and a half wide, rose from the aurora, and passed through Aries, Cassiopeia, Ursa Minor, and the square of Ursa Major, until reaching the zenith, it gradually disappeared. At half past eleven the aurora again began to sink slowly, and did not rise afterwards. At five minutes before twelve, a large brilliant meteor, the only one observed through the night, passed Ursa Major. At one o'clock, A. M. the highest parts of the aurora about the magnetic north, had sunk to within six or seven degrees of the horizon; yet bright coruscations occasionally emanated from it till two, when the observations were discontinued, as no more interesting meteoric appearances were likely to occur.

I will now adduce some facts from which a cursory reader, without wading through the preceding dry investigation, will be able to draw the conclusion, that the aurora is certainly very near to the surface of the earth.

During a brilliant aurora which appeared at Edinburgh on the 5th of December, 1801, a noise was distinctly heard by Dr. Brewster, who at that time published the following description of it—

"The whole northern part of the horizon was covered with a thin, transparent, luminous cloud, which emitted almost as much light as the moon when three days old. This luminous cloud sometimes appeared settled, and totally free from all manner of motion or agitation. At other times, the agitation was extremely great, and the coruscations, or streams of light, which were perpendicular to the horizon, flew with the utmost rapidity from east to west, and from west to east. One of these coruscations, which appeared in the north-west, was about thirteen degrees long, and one-half of a degree broad. Its western edge was tinged with red and violet, and its brilliancy was almost equal to that of the moon in her first quarter when the sun is a few degrees below the horizon. * * * During this evening a *whizzing noise* was heard in the air, exactly similar to the sound which accompanies the passage of the electric spark from the glass cylinder to the conductor; and I was informed by a friend that during the time that the coruscations were most vivid, the top of St. Giles' steeple seemed to emit rays of light in every respect similar to a Leyden jar when surcharged with the electric fluid."

Wargentin, in the fifteenth volume of the Transactions of the Swedish Academy, says that Dr. Gister, and Mr. Hellant, who had resided for some time in the north of Sweden, made at the request of the Academy, a report of their observations on the aurora borealis.

The following is an extract from Dr. Gister's account:—"The most remarkable circumstance attending the northern lights, is, that although they seem to be very high in the air, perhaps higher than our common clouds, there are yet convincing proofs that they are connected with the atmosphere, and *often descend so low in it, that at times they seem to touch the earth itself, and on the highest mountains they produce an effect like a wind round the face of the traveller.* He also says, that he himself, as well as other credible persons, "had often

heard the rushing of them as if a strong wind had been blowing, (although there was a perfect calm at the time,) or like the whizzing heard in the decomposition of certain bodies during a chemical process." It also seemed to him that he noticed "a smell of smoke or burnt salt." "I must yet add," says Gister, "that people who had travelled in Norway, informed me they had sometimes been overtaken on the tops of mountains by a thin fog very similar to the northern lights, and which set the air in motion; they called it sildebleket, (Haring's lightning,) and said that it was attended by a piercing cold, and impeded respiration." Dr. Gister also asserts, that he often heard of a whitish gray fog of a greenish tinge, which, though it did not prevent the mountains from being seen, yet somewhat obscured the sky, rising from the earth, and changing itself at last into an aurora; at least, such a fog was frequently the forerunner of this phenomenon."

Mr. Nairne is confident that he has heard a hissing and whizzing noise when the polar lights were very bright, and M. Cavallo affirms that more than once he has heard a crackling noise from polar lights. Giesecké, who resided in West or Old Greenland, says, "the polar lights sometimes appear very low, and then they are much agitated, and a crashing and crackling sound is heard, like that of an electric spark, or the falling of hail.

Professor Hansteen says we have so many certain accounts of the noise attending the aurora, that the negative experience of southern nations cannot be brought in opposition to our positive knowledge; and concludes with stating that he himself knows several persons who have distinctly heard the same sounds; he expresses his surprise that a fact so well established should be called in question, and he relates, with some sharpness, a conversation he once had on this subject with an Englishman, who remarked that the Norwegian tales of noises proceeding from polar lights, were akin to the ghost stories of his country.

No noise has ever been heard to proceed from the aurora either in the United States, or in the southern parts of Great Britain, nor did Capt. Franklin witness it himself, but he says the uniform testimony of the natives, and of all the older residents in the country, induces him to believe that it is occasionally audible.

Dr. Richardson frequently observed the lower surface of nebulous masses illuminated by polar lights; a fact illustrative of the comparatively low situation of these auroræ, which could not have been higher than the region of the clouds.

Capt. Franklin, in like manner, observed low auroræ. "The important fact," says he, "of the existence of the aurora at a less elevation than that of dense clouds, was evinced on two or three occasions this night, 13th February, 1821, at Fort Enterprise, and particularly at 11 hrs. 50 min., when a brilliant mass of light, variegated with the prismatic colours, passed between a uniform steady dense cloud and the earth, and in its progress completely concealed that portion of the cloud which the stream of light covered, until the coruscation had passed over it, when the cloud appeared as before."

Capt. Parry, as stated in his third voyage, observed auroræ near to the earth's surface. It is said, that while Lieutenants Schener and Ross, and Capt. Parry, were admiring the extreme beauty of a polar light, they all simultaneously uttered an exclamation of surprise at seeing a bright ray of the aurora shoot suddenly downward from the general mass of light, and between them and the land, which was only 3000 yards distant. The ray or beam of the polar light thus passed within a distance of 3000 yards, or less than two miles, of them. Further, Mr. Farquharson observed in Aberdeenshire an aurora borealis not more than four thousand feet above the level of the sea, and he agrees with Richardson, Franklin, &c. in believing that the auroræ occurs in a region immediately above that of the clouds, and of course vary in height with the different states of the atmosphere. But although this region was very low on the 20th of December, 1829, in the polar light seen from Alford, we know that at times it is several miles high, agreeing with the observations of these intelligent travellers. We have frequently seen the aurora when the height of the clouds could not be estimated at less than two or three miles, and at other times not higher than a thousand or fifteen hundred feet. The arches are sometimes close together, and are probably thin fringes, leaning towards the south, as appears from the observation made at Cumberland house on the 6th and 7th of April, 1820, when the whole northern sky to the zenith was filled with wreaths and flashes, which assumed the shape of arches after they passed some distance to the south of the zenith.

The centres of the arches were often carried from the zenith sixty or seventy degrees to the south, while the extremities did not materially alter their positions; and on two occasions at Cumberland House the centres of arches were not more than ten degrees above the northern horizon, when their extremities reached the east and west points of the compass. The number of arches seen at any one time seldom exceeds five, and is seldom limited to one. The arches generally cross the magnetic meridian at right angles; when two or more are visible at once they are concentric, and tend to the magnetic east and west, the streamers in the direction of their length, are parallel with the dipping needle; the number of arches often increased or diminished in their advance to the zenith. The revolution of an arch from north to south occupies a space of time from twenty minutes to two hours; their velocity in general was not so great at Cumberland House.

Evidence is not wanting, also, in the United States, that different auroral arches are seen on the same evening at no great distance from each other.

On the seventeenth of May, 1833, an auroral arch was seen at Saratoga, in the state of New York, of which the following is a description by an anonymous writer. "Choosing to step into the street at about a quarter past nine o'clock, I was surprised at the universal brightness of the night. The sky was rather hazy, and heavy piles of clouds hung in the north, from behind which a flood of light was beam-

ing, tinging their edges with silver. Presently there shot up broad beams of light from the north-west, followed in rapid succession by like streams of every size and form, chasing each other high over the zenith. The clouds in the north soon in a great measure disappeared, and the body of light forming the magazine whence issued the streams before mentioned, expanded so as to cover nearly one-fourth part of the heavens. No blazes of light however shot up from the north; but the flashings from the north-west streamed over two-thirds across the span of the heavens, forming at times, and for a moment, a brilliant arch of light, and then breaking into a thousand fragments, darting and twinkling about in every fantastic form.

"At half past nine, counter columns of light began to shoot up from the E.N.E. These were not so brilliant as those proceeding from the north-west; but they stretched up until the pillars met from both directions, and by meeting together formed a kind of luminous coronal, floating about the zenith. There was no variation of colours—no streams of lake and purple mingled with the silver—but the spectacle was one of surpassing beauty and grandeur. The streaming pillars from the two directions thus meeting in the centre of the arch, diverging to the horizon like a pair of extended compasses, were well defined for the space of ten minutes. But it is impossible for me to give any adequate idea of the grand effect of this magnificent display of the fire-works of the sky. The undulations of the masses of light—the brilliancy—the breakings off into myriads of beautiful forms—curling in as many wreaths and folds—the radiance, bright as the silver veil of the Prophet of Khorassan, imparted a grandeur and glory to the exhibition which I can never forget. At one time, I could count the minutes on my watch dial by the light, and I succeeded in reading a bit of manuscript which I happened to have in my pocket. At ten o'clock the flashings ceased—the clouds of light gradually disappeared over head; and in fifteen minutes nothing remained of the magnificent phenomenon, but a mass of strong, still brightness in the north."

On the same evening, an arch of aurora was seen at Philadelphia about 200 miles south of Saratoga. An account of this arch was given by Professor Bache in this Journal, vol. xii. p. 5. It is enough for my present purpose to state that these arches could not have been the same, as the arch at Saratoga made a bend in the zenith of sixty or seventy degrees, whilst the one at Philadelphia stretched entirely across the heavens in one uniform direction.

P. S. After I had terminated the above investigation, the December number of the Philosophical Journal arrived from Europe, containing another attempt to prove that auroral arches are far above the region of the clouds.

From the account given by Mr. Potter it appears that on the night of the 21st of March, 1833, an auroral arch was seen at Edinburgh, at Armagh in Ireland about 160 miles from Edinburgh, and at Athboy, about fifty or sixty miles from Armagh. From observations made at Edinburgh and at Armagh, Mr. Potter concludes the height

of the arch to be about 142 miles; and if the observations at Armagh and Athboy could be depended upon, the height would be 194 miles; the latter, however, he gives up, but cleaves to the former, and seems very desirous that the public should do him the credit to believe that he by no means countenances the idea that auroral arches are in the neighbourhood of the clouds.

Now, most unfortunately for Mr. Potter's calculations, we have no reason to believe that the Armagh arch appeared at all till after the almost entire disappearance of the arch at Edinburgh. The last observation was made on the Edinburgh arch fifty-five minutes after eight o'clock, and the first observation on the Armagh arch at forty-four minutes ten seconds after eight. Now, allowing thirteen minutes for the difference of longitudes between Edinburgh and Armagh, it appears that the Armagh arch made its appearance just about the time that the Edinburgh arch was disappearing; for after this last observation upon the Edinburgh arch, the observer says it was hardly visible. Again, the Athboy arch did not appear till 9 o'clock, which, allowing for the difference of longitudes, is twenty-two minutes after the arch at Edinburgh had disappeared, or nearly so; and it was observed for twenty minutes after that without any intimation being given of its fading away; and the observer says it had disappeared at 10 o'clock, which is one hour and twenty-two minutes after the fading away of the Edinburgh arch. Now this could not have been the case if there had been but one arch, as supposed by Mr. Potter, at the height of one hundred and forty-two miles. Again it appears from the observations on the Edinburgh arch that its middle moved from between γ and ζ Leonis to α Leonis, ten degrees, in ten minutes, whilst the Armagh arch moved only two degrees in five minutes, or with less than half the velocity of the Edinburgh arch; which could not have been the case if they had been the same arch. But a circumstance, which puts it beyond doubt that the Armagh and the Athboy arch could not be the same, remains yet to be mentioned.

The Athboy observer says, the arch was one degree broad in the east, and increased to five or six degrees in the West, whilst at Armagh no such increase in width was seen. Now as these two places are only about fifty or sixty miles apart, it is certain that the arch, if it was the same, could not have been ten miles high, or much of it would have been seen in common by both observers, and of course its uncommon appearance to the Athboy observer could not have been unnoticed at Armagh.

It may be thought by my readers that I ought to mention Professor Airy's remarks on the auroral arch, as given in the same number of the Philosophical Journal which contains Mr. Potter's investigation. But as all the observations are not given from which the Professor draws the conclusion that the arch was between fifty and sixty miles high, I will merely observe that as I have shown that in the case investigated above there were more than one arch, it is probable in this also there were more than one; more especially as "the observations at Gutsborough gave the altitude of the arch greater than was consistent with the others; and the observations at Armagh, could not

easily be reconciled with those made at other places, either for the elevation or the general appearance of the phenomena."

I hope Professor Airy, who has the original observations, will examine whether the contradictions may not be reconciled by the supposition of more arches than one.

If the aurora is really produced by the overlapping of different currents of air with very different 'dew-points,' as suggested in a paper of last year, it will be easy to show, independent of magnetism, why the streamers are not perpendicular to the horizon, but lean in the direction in which the arch moves, and I think will be likely to have a greater inclination the more rapidly the arch moves. But the development of this idea must be reserved for another time.

In conclusion, I will observe, that as I have now demonstrated that the aurora is from one to three miles high, and as it always has been accompanied by a sudden change of 'dew-point' during the last two years, and as the remarkable meteoric phenomena of the 13th of November last were attended by a sudden and very great change in the 'dew-point,' similar to what occurs when the aurora appears, I am justified in saying that the plausibility of the hypothesis which was formerly advanced to account for the aurora is much increased; but many more facts must be yet accumulated before it deserves the name of *theory*.

FRANKLIN INSTITUTE.

Quarterly Meeting.

The forty-first quarterly meeting of the Institute was held at their Hall on Thursday, April 17th, 1834.

Thomas Fletcher, Vice President, in the chair.

William Hamilton was appointed Rec. Sec. P. T.

The minutes of the last quarterly meeting were read and approved.

Donations of books, charts, models, and minerals, were received from Messrs. George Fox, Carey, Lea & Blanchard, Frederick Fraley, J. Henry Bulkley, Israel White, J. J. Barclay, of Philadelphia, and Petty Vaughan, Esq. of London, and from the society instituted at London for the encouragement of Arts, Manufactures and Commerce.

The actuary laid on the table the various journals which had been received in exchange for the Journal of the Institute during the last quarter.

The chairman of the Board of Managers read the forty-first quarterly report of the Board, which was accepted.

The Treasurer's report for the quarter ending April 1st, was read and accepted.

Adjourned. Thomas Fletcher, V. P.

William Hamilton, Rec. Sec. P. T.

Forty-first Quarterly Report of the Board of Managers of the Franklin Institute.

The Board of Managers respectfully submit to the Institute the following report of their operations for the last quarter.

In compliance with the custom established by their predecessors, the present Board proceeded immediately after the date of their organization to the appointment of standing committees, in whose charge has been placed the important interests of the Society. These committees have, as appears by their reports, been attentive to the duties assigned to them. The subject of Education has always been one of deep interest to the members of this Board. By the committee having charge of this department every effort has been, and will continue to be, used which the means at the disposal of the Board will permit, to enlarge by its operations the usefulness, and the reputation of the Institute.

The course of instruction by lectures was closed on Saturday, the 22nd of March, in an able address on the subject of education, delivered by Dr. J. K. Mitchell, our much esteemed Professor of Chemistry. The just appreciation of this department of the Institute, by the public, is evinced by the unprecedented number of the class which attended the lectures, and the managers have the gratification to announce that the interest manifested at the opening of the course continued unabated at its termination.

The pleasure which they have in making this communication, however, is in some degree diminished by the existence of an inconvenience experienced from the attendance of a large number of minors. It is with much pain that the Board inform the members of the Institute, that in the performance of the duties intrusted to them, the committee on instruction, at an advanced period of the course, found it necessary to exclude the entire class of male minors, in consequence of the disorderly conduct of a *few*, and to readmit such only as had the personal guarantee of their parents or guardians, for their good behaviour.

To prevent the recurrence of this evil, which militates against both the comfort of the adult class, and the high reputation of the Institute, will be the effort of the Board of Managers, and they confidently rely on the support and co-operation of the members of the Institute.

The course of instruction for the session of 1833–34, was subdivided as follows:—*Twenty* lectures on chemistry, and its application to the arts. *Twenty* lectures on natural philosophy, and its applications to, and connexion with, the arts. *Eight* lectures on astronomy. *Ten* lectures on Meteorology. A school for architectural, miscellaneous, and mechanical drawing, and an English school.

The Board of Managers desire to unite their cordial acknowledgments with the warm demonstrations of esteem given by the class, to the several Professors and Lecturers, for the zeal and ability which they have displayed in the service of the Institute. For the schools

under the patronage of the Institute the Board feel the most anxious solicitude; they are both under the care of highly gifted teachers, and present to the apprentices of our city, opportunities for the acquisition of knowledge of the most substantial and useful kind.

The committee on premiums and exhibitions, under instructions from the Board, proceeded to consider the propriety of holding an exhibition for American manufactures during the autumn of the present year, and after mature deliberation have decided against the measure, which decision has been confirmed by the Board.

The committee on science and the arts constituted at the last meeting of the Institute, have enrolled among their members a considerable number of those who are willing to serve the institution in its scientific labours; many, it is believed, have not yet come forward, from a sentiment of modesty, which, however estimable in itself, is deemed to be wholly inapplicable in this case, and to be mischievous in its tendency. No member is required to come forward and declare that he has ability to perform such a duty, but simply to express a willingness to take part in the labours which his colleagues may assign him after they have been intrusted to them by the Institute.

This committee has already organized by the appointment of Prof. A. D. Bache, as chairman, and have, by division into sub committees, taken charge of the unfinished business of the committee of inventions, and of some new business which has been brought before them. In those cases in which the sub-committees have not been required to act simply as counsellors to inventors, their reports will be found upon the pages of our journal.

The subject of weights and measures in this commonwealth, referred by the House of Representatives to the Managers of the Institute, has been reported upon by the committee whose names were stated in the last annual report of the Board. The number of copies of this report required for the use of the Legislature, has been printed under the superintendence of the committee, at the expense of the state, and forwarded to the Secretary of the Commonwealth for transmission to the Legislature.

The subject has, it is hoped, been placed in such a light, and in so simple a form, that should the recommendation to urge upon Congress a general legislation for our entire country not be acceded to, or be deemed likely to produce too great a delay, the Legislature of the state will be able to adopt a system which, while it produces permanent uniformity, will not lead to temporary confusion.

The measures recommended have been to fix existing standards by providing authentic copies of those in use at the period of the declaration of independence, by securing their distribution and preservation, and providing for their restoration when lost or injured, by reference to natural invariable standards. In this recommendation the committee have very properly rejected such reference to scientific deductions, as rest exclusively for their accuracy upon the state of experimental philosophy of the day, and would be liable to change in the advance of science.

The awarding of premiums and medals for improvements in the

arts, from the funds derived from the legacy of the late Mr. John Scott, to the city of Philadelphia, has been vested, for the period of seven years by the Select and Common Councils of our city, in the Franklin Institute, and steps have been taken by the Board of Managers to secure the efficient investigation of articles submitted for the premiums by the committee of science and the arts. The practical experience which may be brought to bear through the medium of sub-committees of that body on inventions, or improvements in the various branches of science or the arts, will secure to candidates, tribunals admirably calculated to appreciate the value of their claims, while in the whole committee, the relative importance of the different branches may be expected to be duly weighed.

The mark of confidence in the Franklin Institute, shown by our city authorities, in the ordinance just referred to, cannot but be highly gratifying to the members; this, combined with the charges intrusted to the Institute by the House of Representatives of our commonwealth, and by the Treasury Department of the United States, serves to show the high estimation in which the disinterested labours of the institution are held, as well at home as abroad, throughout our own state, and by our countrymen generally.

(Signed,) Alexander Ferguson, Chairman.

William Hamilton, Actuary.

Extract from the Minutes of the Stated Meeting of the Board of Managers of the Franklin Institute, held May 1, 1834.

The following communication from the Clerk of the House of Representatives of the commonwealth, having been read, was ordered to be published.

In the House of Representatives,
March 31, 1834.

The committee to whom was referred the communication of the Secretary of the Commonwealth, accompanying the report of the Franklin Institute of the State of Pennsylvania, on Weights and Measures, made report,

That they have read with great interest the report and appendix forwarded by the Institute, and that it appears to them to be a work of great merit, and well deserving the early attention of the House. It evinces research, talent, and judgment, and the committee consider the Institute as entitled to the thanks of the house for the manner in which they have discharged this duty; and they report, without alteration, the two bills drafted by the Institute, and severally entitled—

"An Act to fix the Standard of Measures and Weights in the Commonwealth of Pennsylvania."

"An Act to fix the Denominations of Measures and Weights in the Commonwealth of Pennsylvania."

Extract from the Journal.

Fr. R. Shunk, Clerk.

In the House of Representatives,
April 12, 1834.

On motion of Mr. Crawford, of Franklin,

Resolved unanimously, That the thanks of this House be presented to the "Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts," for the very able and elaborate investigation on the subject of Weights and Measures, undertaken by them in compliance with the resolution of the House of Representatives of the 5th of April, 1833, and for the report made by them on the 24th of March last, in pursuance thereof.

Resolved unanimously, That the Clerk of this House transmit to the Institute a certified copy of these resolutions; and of the report of the select committee to whom the communication of the Franklin Institute was referred.

Extract from the Journal.

FR. R. SHUNK, Clerk.

On motion, it was

Resolved, That the thanks of the Board be presented to the committee on weights and measures, to whose successful exertions in the performance of the important duties delegated to them, the Institute is indebted for the expression of legislative approbation which has recently been bestowed on it.

REPORT OF THE COMMITTEE ON WEIGHTS AND MEASURES.

APPENDIX TO THE REPORT OF THE COMMITTEE OF THE FRANKLIN INSTITUTE ON WEIGHTS AND MEASURES.

Report on the subject of Weights and Measures made to the Commissioners for Revising the Laws of the State of New York. By James Renwick, Professor of Natural Philosophy and Chemistry in Columbia College.

(1.) It is conceived that it would be inexpedient, indeed it may be said, impossible, to change the present denominations of weight and measure. The terms foot, yard, pound, ounce, bushel, gallon, quart, &c. are identified with our language; and it would be as easy to subvert the form and dialect of our ordinary colloquial speech, as to introduce new standards of weight and measure, with new names. All that could reasonably be attempted, is to refer the units of the several denominations to some measure in nature, constant, determinate and easily determinable, making such slight changes, not appreciable in the transactions of trade, as will tend to the facility of this determination; and, in addition, the means by which the accuracy of existing stan-

dards may be tested in future times, or the standards themselves restored, if lost, must be defined To do more would be to attempt what is wholly beyond the reach of legislative power.

That this view of the subject is correct, may be shown by an appeal to the experience of the people of France. At the breaking out of the Revolution in that country, the steps necessary to form a system of weights and measures entirely different from those formerly existing, and resting not merely for their standards, but for their absolute units, upon a measure deduced from a constant dimension in nature, were undertaken. The result of this investigation was in a system that, if tested by the facility of applying to it the principles of decimal arithmetic, by the scientific and practical skill of the parties employed in the task, or by the great zeal and intelligence shown by them, is deserving of all praise. But in spite of the favourable circumstances existing at that era, when the whole nation was searching after novelties, and no prejudice in favour of any ancient customs could be considered as opposing, it was found that it could not be introduced in its full extent; and that the part on which the proposers most prided themselves, namely, the decimal division, by which it became accommodated to the existing scale of arithmetic magnitude, was the first which required modification. On the 12th of March, 1812, previous to the downfall of the Emperor Napoleon, the ancient denominations of lineal dimension, toise, foot, inch, &c. were restored, but appropriated to measures derived from the metrical system; and since the restoration of the Bourbons, that system has been further modified by the application of the ancient name of pound to the half kilogramme, with which that weight nearly corresponds. Nor does the necessity of making these changes arise from the inveteracy of prejudices, from which the French nation might be considered at the time as almost entirely free, but from causes actually existing in nature. The decimal notation, although long use has made it habitual, is by no means the most convenient for the calculations of arithmetic; it seems to have originated in no other cause than the habit of counting upon the fingers in the infancy of society; and although, from established habit, it would be proper in the ascending scale of weights and measures in ordinary use, and in the descending scale in scientific inquiry, is not applicable to the divisions of the unit in traffic. For this last purpose, a system admitting of binary division is alone fitted; and with this the duodecimal division of the foot is sufficiently agreeable; while it is found in the full extent in the customary divisions of the yard, the avoirdupois pound, and the bushel. Warned, therefore, by the example of the French, we should attempt no change of names, or new methods of division, for the several units of length, weight, and capacity; while, on the other hand, we learn that slight modifications of the magnitudes of either of these, that will render them

more consistent with each other, and with a standard existing in nature, if such be attainable, are perfectly possible.

(2.) It is a well-known and established physical fact, that the pendulum vibrating seconds of mean time in any given place, is invariable in length. That is to say, that if made of a substance susceptible of variation in length with changes of temperature, the variation of its length will be attended with corresponding variations in the time of its oscillations; while, if so constructed as to remain invariable in length, the duration of its vibration in very small circular arcs, and in an atmosphere of unvarying pressure, will be constant: and although no experimental pendulum is invariable in length under differing temperatures, nor the pressure of the atmosphere constant, yet these two circumstances may be abstracted from, by means of corrections deduced from accurate experiments on the law of expansion by heat, and on the buoyancy of the atmosphere. The length of the seconds pendulum varies with the change of latitude, according to a regular and well-known law; and it has lately been shown to be affected by local circumstances. Still, however, the length of the seconds pendulum in a given position, when corrected for changes of temperature, and atmospheric pressure for the magnitude of its arc of vibration, and reduced to the level of the sea, is a standard, determinate and invariable in its dimension, that does exist in nature: it is also determinable, without any great difficulty, by persons furnished with the proper instruments, and possessed of the requisite scientific knowledge. For the best methods of determining the length of the pendulum, the world is indebted to Borda and Kater; and the method of the last is more especially remarkable as one of those brilliant discoveries that mark eras in science, and confer immortality on their inventors. The pendulum then should be recognised in the revised laws as the instrument whereby the standards may be restored, if lost; and with whose dimensions they are to be at present compared, by way of making them comparable with the measures of foreign nations. In confirmation of this opinion, I may urge the examples of the French, the Danish, and the British governments, and that, still more recent, of Sweden.

(3.) As to the mode of determining the unit of length in relation to the standard existing in nature, and of deducing thence the standard of weight, and of measures of capacity:—

I shall assume that the unit of lineal dimension that will be adopted by the State, is the yard in common use on the day of the declaration of independence, as prescribed in the law of 1784. This was, no doubt, identical with the British parliamentary yard made in 1760. It luckily so happens, that we possess the measure of the seconds pendulum made in the buildings of this institution in reference to that very standard, and consequently the

means of making a yard that shall be identical with the yard of the Revolution. For this purpose it will be sufficient that the law should recognise that the standard yard shall bear a certain proportion to that measure of the pendulum. When the necessary experiments shall have been made to determine the true length of this yard, its extremities should be marked upon disks of an imperishable material, (gold or platinum, for instance,) inserted at a proper distance in a bar of brass, or rather of a more durable alloy of copper than what, in ordinary language, is called by that name. The distance between the two extremities of a bar is inadmissible in a standard, in consequence of the alteration in length that is caused by wear, as known in practice in the history of the yard preserved in the British Exchequer.

Such a bar will be subject to dilatation and contraction by heat and cold; but the temperature at which its length is compared with the pendulum should be given, and when it is to be compared with, or its length transferred to, bars of the same material, as both will be equally affected, no legal enactment is in this case requisite; but as measures in ordinary use are most frequently of other materials, it will be necessary that the temperature at which such comparisons must be made, or to which they must be reduced by calculation, should be strictly specified. It would be proper to seek for this purpose a temperature, independent of the indications of instruments that, in the improvement of science, may become obsolete, and constant in all varieties of physical circumstances. Such a temperature is marked in nature while the process of liquefaction is going on, or what is commonly called the freezing point of water. This, therefore, should be declared, in the new law, to be the temperature at which such comparisons should be made, or to which they should be reduced.

The extension in length of the unit of lineal dimension will furnish the elements of measures of a larger size; its square, or that of one of its multiples, will be the unit of superficial measure, and its cube of solid.

To determine the unit of weight, it will be necessary to have recourse to some fluid that can at all times, and under all circumstances, be obtained pure and homogeneous. Distilled water is a fluid of this nature, and the law should declare that the weight of a certain bulk of it shall be equal to a certain defined proportion, or multiple, of the unit of weight. To make this declaration specific, the circumstances under which the comparison is to be made, must be declared in the law; for water, like all other substances, will be of different weights under equal bulks, at different temperatures; and its apparent weight will be affected by the varying pressure of the atmosphere, as well as that of the weights employed, while their absolute gravity is that they would possess *in vacuo*. There appears at first sight to be a practical difficulty in this determination, in consequence of its being almost

impossible to ascertain with the necessary precision the interior dimensions of a vessel; but we have a remedy in the well-known physical fact, that a solid body loses, when weighed in a liquid, a portion of its weight of an equal bulk of the liquid; and the exterior dimensions of a regular solid are determinable within the requisite limits. But this experiment will be affected by the calorific expansion of the substance employed, and by the buoyancy of the air affecting its absolute weight. The law then must not only express the absolute weight (in vacuo) of a certain bulk of water in terms of the standard of weight, but must describe the temperature of the water, and the substance of which the weights and the experimental solid are to be made. It so happens, that in this case also we have a temperature, or rather a state of water, defined by a physical fact independent of instruments or extrinsic causes. Water does not follow the general rule of contraction; contracting to a certain limit, it again expands while cooling for several degrees above its freezing point. This fluid, therefore, has a maximum of density, and varies so slowly in bulk on each side of this maximum, as to afford room for the greatest accuracy of experiment.

Two methods exist of defining the magnitude of measures of capacity. The first and most obvious would be to prescribe the cubical dimensions of the unit in terms of the unit of length; but this is liable to the objection already stated, viz., the great difficulty of ascertaining with accuracy the internal dimensions of a vessel; the second consists in prescribing the weight of water that the measure shall hold, and this is in all respects preferable, but especially so from the very great ease with which the determination can be made. Here also it will be necessary to declare the atmospheric pressure and temperature at which the experiment shall be made, and this may be simply done by enacting that the water shall be at its maximum density, and pressure of the atmosphere at a mean.

(4.) The law of the province of New York of 1703, the act of 1784, and the revised law of 1813, recognise two standards of weight, without prescribing their relation to each other. Of these, the troy pound has long ceased to be used in any purely mercantile transaction, except in the retail trade of the apothecary; gold and silver are indeed also weighed by the troy pound: the former object is of very trifling importance, and the latter being governed by the practice of the mint of the United States, may be considered as a subject on which the national government has virtually legislated, and on which it would be improper for the state government to act. No other unit of weight then should be retained but the avoirdupois pound; and as the quintal of 112lbs. has been abolished in practice, no other denomination of that species of weight, except the usual binary subdivisions of the pound.

Did the original law of 1703, or the act of 1784, authorize two different units for liquid and dry measures of capacity, I should recommend the abolition of one of them as useless, and particularly from the confusion that arises from two different magnitudes being called by the same name. But it appears evident from the law of 1784, that but one measure is contemplated for both objects. The introduction of the British wine gallon is, therefore, unwarranted by the law of 1703, by the ancient practice of the province, or by the law of 1784, and has probably crept into the revised law of 1813, in consequence of its being used in the Customs of the United States: it is, therefore, consistent with the ancient law to prescribe but one standard for measures of capacity; but it might be expedient to permit the retail of articles paying duties to the United States in measures derived from the offices of the several surveyors of the Customs.

(5.) The act of 1784 adopts, as the standards of the state, certain weights and measures in the custody of William Hardenbrook, the sealer of the city and county of New York; and directs that he shall deliver them to the clerk of the city, in the presence of the mayor, recorder, and one or more aldermen, declaring upon oath that they are the identical articles received by him from the British exchequer. The importance of the object justified the solemnity of the manner pointed out for the transfer of these ancient and venerable standards of the province to the custody of the authorities of the state. But no corresponding means of preserving them were pointed out, and it is to be believed that they are no longer in existence; for a law of the 24th of March, 1809, adopts as the standard yard a brass measure, procured by the corporation of New York, in 1803, from the British exchequer; the liquid measures of capacity in the custody of the Secretary of State bear date in 1822, (at least nine years later than any existing law,) and the standards of dry measure are dated 1804. Now, as it has been found that the yard, purporting to be a copy of that described in the law of 1809, and deposited in the Street-commissioner's office, in this city, is shorter than the usual English yard of the beginning of the present century, which was itself shorter than the standard, as examined in 1760, and perpetuated by the celebrated *Bird*, and as we know of no adequate means employed in 1804 and 1822 to determine the truth of the new measures of capacity, I conceive I am warranted in stating that the original standards of weight and measure of this State, as they existed on the day of the declaration of its Independence, have been lost; and the present is one of those junctures that call for scientific investigations to recover such of the ancient denominations as it may be expedient to restore identically, and to deduce from them the others in the most unexceptionable manner. With a view to this object, I have already stated that I consider the parliamentary standard of 1760, as unquestionably identical

with the standard of our state as it existed at the Revolution, and that the experiments of Sabine, in Columbia College, have provided the facility, within our own state, of restoring the yard to its original magnitude. After the experiment shall have been made in this building, the measure should be transferred to some proper public edifice, the site at least of which may, in all succeeding ages, be resorted to, in order to confirm, or restore to their primitive dimension, existing weights and measures.

If, however, it should be preferred that the yard at present in the office of the Secretary of State should be the standard, it will be essential, in order to perpetuate it, to make similar experiments of comparison with the pendulum, one set of which should be made in this institution, as in this way alone its ratio to foreign measures (particularly to those of England) can be obtained. But I conceive this plan to be objectionable in several points of view, particularly as more difficult and expensive, and as adopting for a standard a measure whose authority is at least questionable. It would also prevent any positive legislation on the subject until after the experiments shall be made. The English avoirdupois pound, as a separate standard, appears to have been lost. So long since as 1798, Sir George Shuckburgh could find none in the public offices that could be considered as authentic,* and it has, therefore, been customary in England to deduce it from the troy pound, on the principle that it was equal to 7000 grs., of which the troy pound contained 5760. The experiments of Graham, in 1743, on weights of 15lbs., made the avoirdupois pound of which, at that time, authentic standards still remained, equal to 6998.5 grs. troy, while on the comparison of the single pound it was equal to 7004 grs.† The avoirdupois pound might, therefore, be fairly taken at 7000 grs. troy. But this is evidently of the customary weight as usually employed, and not of the pound discovered by Kater, in the custody of the clerk of the British House of Commons. Of the customary weight used in the mints of this country and England, the weight of Sir George Shuckburgh made by the celebrated Troughton may be considered as the most authentic specimen. Assuming the true magnitude of the avoirdupois pound to be 7000 grs. troy, the weight of a cubic foot of water, as calculated from the experiments of Shuckburgh, at its maximum of density, and weighed with brass weights, is 999 ounces and $\frac{67}{100}$, the measure of the experimental solid being performed upon a scale, whose standard temperature is 62° of Fahrenheit‡. The experiments of Shuckburgh have been recently repeated by Kater,¶ and from these I have calculated the weight of a cubic foot of water at its maximum of density to be 999 $\frac{32}{100}$

* Philosophical Transactions Abridged, vol. xviii.

† Philosophical Transactions Abridged, vol. xviii.

‡ Young's Natural Philosophy, vol. ii.

¶ Third Report to the British Parliament on weights and measures. Philosophical Transactions for 1821.

ounces, assuming the measure of the experimental solid to be made on a scale whose standard temperature is the melting point of ice: no danger then need be apprehended in taking the weight of a cubic foot of water at 1000 ounces avoirdupois, and prescribing that the legal weight shall be such as will give that determination.

The discrepancy between this and the present received weights (if accurate transcripts of the former British standards) will not exceed three-tenths of an ounce in a hundred pounds, a quantity absolutely insensible in the course of traffic, less than the difference in the current standards of the avoirdupois pound, in 1743, and far less than the amount of discrepancy discovered in the several States of the Union, as detailed in the able report of Mr. Adams.

For the unit of measures of capacity, I would propose the adoption of the gallon. It is sufficiently large to prevent any chance of error in the determination of the most usual denomination of dry measure (the bushel,) and it is itself the customary unit of liquid.

We shall now proceed to consider what ought to be the size of this unit. The Act of Parliament, of 13th William III. cap. 5. prescribes that the standard bushel shall contain 2150 inches. But among the standards preserved in the British Exchequer, for the bushel and its several parts, considerable discrepancies exist, and it would be difficult to determine from which of these the bushel of the Revolution was derived. Their several magnitudes are as follows:—

	Bushel.	*Gallon.*
	2215.2	276.9
	2234.4	279.3
	2163.2	274.4
	2128.9	266.1
Mean	2185.4	272.5

Still greater discrepancies exist in the usual bushels of different parts of the United States, which vary in the two extremes from 1925 to 2358.6 inches, (giving the gallon the two dimensions of 241.25 and 294.8,) as stated in the report of Mr. Adams.

Instead, however, of prescribing the cubic contents of measures of capacity, it would, as has been already explained, be much better to determine their magnitude by declaring the number of pounds of distilled water at the maximum density and mean pressure of the atmosphere that the unit should contain. If this weight be taken at 80 lbs., the bushel will be 2214.36 cubic inches, and the gallon 276.8. These dimensions differ less from the standard now adopted in England of 2217.6 and 277.2 than either of the above dimensions do from each other.

This method has a great advantage over that of actual measurement, inasmuch as the weight can be determined with suffi-

cient accuracy, wherever good balances and just weights are to be had: while, to determine the cubic contents of a vessel is one of the most difficult operations of practical geometry, and is liable to such uncertainty, that in all recent investigations into the magnitude of measures, their weight when filled with distilled water has been resorted to in preference as the surest criterion.

It might, in this stage of the discussion, be asked, Why propose a system founded upon principles and facts requiring so much accuracy of determination and knowledge of science? And, Why not have recourse to England at once, and obtain thence their new standards?

To the first of these it may be replied, that the practical adjustment of weights and measures is always liable to certain errors; that these, in the lapse of years, where no checks are provided, would reach such an extent as wholly to obliterate the recollection of the original standards. The more strict then the provisions of the law, in respect to accuracy, the less will be the danger of error, from the discouragement it will give to rude and inartificial methods of comparison; and the more scientific the means of recovery and examination that are pointed out, the greater will be the certainty of perpetuating, or restoring, the standard in after-ages. As to a recurrence to England, a variety of reasons would oppose it, each of them valid and sufficient in itself: a proper feeling of national pride would forbid our asking aid of a foreign country, in a matter for which our own artists and men of science are competent. Economy also forbids it, as standards identical with those of the British government could only be obtained by sending out a competent person to superintend their construction, and compare them strictly with the originals. The articles vended in trade as accurate measures are not to be depended upon implicitly, and, however suitable to commerce, would be unfit for a national object; moreover, there are certain inaccuracies in the English law itself, which I cannot but believe must ere long require its revision in that country, and we should in that event obtain and bring into use a system differing from that which now exists among us, with every probability that it could not be permanent. Neither is it likely that any agent of our State, however fully authorized and accredited, could obtain all the necessary facilities.

The errors I allude to in the English law, which will be fatal to its own permanence, are—that the comparison with the pendulum which is used to define the unit of lineal dimension has been made in a private house, which cannot be reasonably considered as accessible for public purposes; that the length there determined has been assumed to be the universal length in the same parallel of latitude, while it has been conclusively proved that this length is influenced by local causes, a fact, that although not then absolutely demonstrated, was so far foreseen by the French commis-

sion, that they define, as the means of restoring the metrical system, if lost or impaired, not the pendulum of the latitude of Paris, but that of a specific place, the national observatory in that city; that the unit of weight (one nearly abandoned in this country) is derived from an experiment that requires a legal enactment to define and perpetuate an arbitrary thermometric scale, instead of taking, as is here proposed, a temperature defined by a physical fact, or law of nature, unsusceptible of modification or mistake under any circumstances; that the bulk of the water whose weight is given (a cubic inch) is much too small for accuracy; and that the unit of measures of capacity is deduced from that of weight, upon principles equally objectionable with those on which the latter is derived from the lineal measure. In addition, it is to be remarked, that the direct comparison and transfer of measures of length is hardly susceptible of accuracy equal to that obtained by means of the pendulum; that the system proposed, looking for its era to the date of the declaration of the independence of our State, would be exclusively and pre-eminently American. Another strong and important argument may be used: the city of New York possesses artists adequate to the construction of almost every part of the necessary apparatus; their skill and talent are now devoted to objects of inferior importance, that neither enhance their reputation nor add to the mechanical credit of the country: let them be employed upon an object of national, nay, universal, interest, and the name they will acquire will probably create a branch of commerce in similar articles, that will add much to the wealth and resources of the State. The importance of this argument was well understood by the French government, and such was the success of the attempt, that it transferred to France, for the supply of its own demands, a branch of manufacture that had previously carried large sums to Great Britain, and struck the first blow to the hitherto pre-eminent reputation of the articles of that country.

(6.) From what has already been stated, it will appear that I am not of opinion that the pendulum of lat. 45°, the northern boundary of our state, could be advantageously used, either as the unit of lineal measure, or as the standard existing in nature whence the unit of lineal measure is to be derived, and with it all other measures.

This, however, is a subject on which I venture to speak not without some hesitation; the authority of Mr. Jefferson is so high, both as a man of science and a statesman, that I do not differ from him without a feeling of extreme diffidence. Still, however, being satisfied that in the present state of knowledge, he would have concurred with me, and that the difference is one, not of opinion, but of existing facts, I do venture to differ from his views, stated as long ago as 1790.

I do not conceive that the pendulum of that latitude is to be

preferred before that of any other as a standard existing in nature, while, as the absolute unit of length, it must be rejected upon the ground of the impossibility of introducing it, in consequence of its discrepancy, and that of all its derivatives from the habitual measures of the country. The latitude of 45° appearing at the first view as the mean between that of the Equator and the Pole, might have been thought peculiarly advantageous. On this head it is to be observed, that it is a matter of question at the present moment between the governments of the United States and Great Britain, what this lat. of 45° is; are we to take for it the latitude determined by Astronomic observation at the surface of the earth, or the latitude corrected for ellipticity which is known by the appropriate name of Geocentric? And in connexion with the present subject, a third view of the question arises, for neither of these is distant from the Equator, the half of the itinerary distance between that circle and the Pole, but the point of bisection falls between them; which, then, of these three positions are we to choose for our experiments, particularly when the two best adapted, and between which the choice would most reasonably appear to fluctuate, are actually within the limits of possession of another nation? It is, besides, to be remarked, as has been before stated, that it is now well known that the length of the seconds pendulum does not depend upon the latitude merely, but is affected by the geological and mineral structure of the place where the experiment is performed, and its vicinity*. Neither is thependulum of 45°, even were the earth a sphere and the density of its surface uniform, the mean pendulum, for that would be found in the latitude of 35° 16′. For these reasons I cannot see any important advantage to be gained from naming the pendulum of 45° in the revision of the statutes relating to this subject.

For all immediate purposes, the inference drawn from the experiments of Sabine in this institution may be received as sufficient, and the liberal spirit of the trustees guarantees that the place of experiment will be accessible for the purpose of the first investigations, and the construction of the standards to be deposited in the proper public office. But it cannot be too strongly urged, that this measure should be transferred to a building, the property of the state, as early as possible, and that in it the instruments and documents connected with this investigation should be deposited. For this purpose, a location near the present seat of government, or perhaps one more central, in relation to the ultimate population of the state, should be chosen; and a preliminary law should provide for this important object.

(7.) The legislative provisions necessary to attain the objects of a well-regulated system of measures, and its recovery, in case of loss, would be most advantageously comprised in two different

* Sabine. Experiments on the Pendulum.

acts; one to become a permanent part of the revised laws—the other to be preliminary and temporary. The provisions of the first should be:—

1. That there shall be but one standard of measure of length and surface, one of weight, and one of measures of capacity, in this state.

2. That the unit of lineal measure shall be the yard, as used in this State at the date of the declaration of its independence, and that for its more precise definition, and in order to its recovery in case of loss, it is declared (until the measure of the pendulum shall be transferred to some appropriate public building), that the said yard has been found, by experiments made with a pendulum, with a brass rod, at Columbia College, New York, in the latitude of 40° 42′ 43″, to bear to the pendulum of that place vibrating seconds in vacuo, and at the level of the sea, at the temperature of melting ice, the proportion of one million (1,000,000) to one million, eighty-six thousand, one hundred, and fifty-eight (1,086,158).* That the yard shall be divided into three equal parts, called feet, and each foot into twelve equal parts, called inches, and shall be measured between two points, engraven upon golden disks, inserted into a brass rod.

This yard will be identical with that adopted in England, each being taken at its standard temperature, according to the principle of comparison pointed out by Wollaston, and used by Kater in his experiments on the measures of France. I am not fully satisfied that this principle is correct, being rather inclined to think that measures should be compared at a common temperature; but it is that which is now received in practice, and has, besides, certain conveniences as applied to this subject, in keeping the proposed system of weight and measures of capacity more near in magnitude to those received in England.

3. That the unit of weight shall be the pound of such magnitude, that the weight of a cubic foot of distilled water at its maximum density, weighed in vacuo with brass weights, shall be sixty-two and a half ($62\frac{1}{2}$) pounds, that the pound shall be divided into sixteen equal parts, called ounces, of which parts the cubic, foot of distilled water, under the same circumstances, shall weigh one thousand (1000) ounces.

4. The unit of measures of capacity, whether dry or liquid, shall be the gallon, which shall be a vessel of such capacity as to contain at the mean pressure of the atmosphere at the level of the sea, ten pounds of distilled water at its maximum density; that all other measures of capacity shall be deduced from the gallon by continual multiplication or division by the number 2, being in the descending scale, half-gallons, quarts, pints, half-pints, and gills; and in the ascending scale, pecks, half-bushels, and bushels. And that, for greater precision, the last, or measure of eight gal-

* The length of the said pendulum is 39.10158 inches.

lons, shall contain at the mean pressure of the atmosphere at the level of the sea, eighty pounds of distilled water at its maximum of density.

(*To be continued.*)

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN DECEMBER, 1833.

With Remarks and Exemplifications, by the Editor.

1. For a *Socket for Holding Awls and other Tools;* Herrick Aikin, Dracut, Middlesex county, Massachusetts, December 16.

This invention has undoubtedly received the sanction of ages, although the experience of practical workmen has not induced them to adopt it. A common awl handle has a ferule at the end, with a socket to receive the shank of an awl. This is the whole affair, and if the patentee had examined the *tool chests* which are prepared in Europe for the use of *gentlemen*, he would have seen, like many others, that he had been anticipated in his *discovery*. We could cite, also, two or three domestic patents for socket awl handles, but, so far as we can recollect, these had about them some new nicnackery which gave to them some claim to novelty, if not to utility. A workman always finds it better to lay out a penny for a handle to each awl, than to be obliged to change it from one to another.

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2. For a *Machine for Tempering Clay;* Nathaniel Adams, Cornwall, Orange county, New York, December 16.

The tempering is to be effected by the usual mode of causing a wheel to revolve on a circular bed of clay; and the novelty, or supposed novelty, of the invention, is the construction of the wheel, and the causing it to roll upon the bed of clay, spirally, alternately approaching the vertical shaft in the centre, and the outside of the bed.

The wheel is to consist of several separate rims, with a space of an inch, or more, between each, the more perfectly to divide and temper the clay. In order to give it the spiral motion, the horizontal shaft, which is drawn round by the horse, is a square bar, having on it a sliding socket, which is round on the outside, that the wheel may revolve upon it. A toothed wheel on the vertical shaft in the centre, gives motion to a pinion which takes into a double rack, connected with the sliding socket, and moves the wheel in and out in the way required. This "contrivance, in combination with the wheel above described, constitutes the claim.

A machine very similar in its construction, and intended for the same purpose, was patented by Mr. O. W. Seely, of Wayne county, New York, on the 20th of July, 1831, and is described in vol. ix. p. 54. The revolving wheels, in that machine, were carried in and out by a screw upon the shaft, which was a more simple plan, and equally efficacious with the one now proposed: and each wheel in it was described as furnished with four rims, or sets of felloes.

3. For a machine for *Cleaning Clover Seed;* Leonard Keep, Tyrone, Perry county, Pennsylvania, December 16.

A circular trough is to be prepared, like that used for grinding bark and other purposes, and pieces of timber attached to arms from a vertical shaft, are to rub round in this trough. The bottom of the trough, as well as the ends of the rubbing pieces, are to be made rough, and the latter are to be so fixed as to be elastic. The upright shaft, which is to be turned by a horse, may, we are told, carry a fanning apparatus.

The description is very imperfect, and there is no claim made.

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4. For a *Bake Oven;* J. Swift Gold, Norwich, New London county, Connecticut, December 16.

This the patentee calls the Union Oven, but the reason for so naming it is not apparent. It is to be made much like the square sheet iron ovens, long used both here and in England, which have a space round them for heated air, and shelves within them to support the articles to be baked.

"The two distinct improvements claimed in this oven, and which are intended to be secured, are, first, the prevention of the loss of heat, by means of the confined air; and, second, the increased effect from the circulation of the heat and air within the oven." The circulation of heat is treated in the specification something like that of water under a given pressure, but we are unable to trace its action. The lower shelf is to be made double, in order to prevent the burning of articles placed upon it. The oven may be put over an ordinary fire, or fixed in other ways, and it may, also, be made in various forms.

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5. For a *Revolving Spinner,* to be used in spinning cotton, &c.; W. Allen Potter, Cranston, Providence county, Rhode Island, December 16.

This patent is taken for a new modification in the arrangement of the rings used instead of flyers in what has been called the ring spinner. The rings surrounding the bobbins are to have grooves on their outer edges, a light band carried by a horizontal pulley at the end of the frame being employed to drive them. This band is to be borne up against the rings by pairs of small friction rollers situated between each of the rings, and sustained on the same horizontal metallic plate which sustains them; the pins upon which these rollers turn, pass through slots in the plate, in order to increase, or to diminish, the pressure of the band upon the revolving rings, and, consequently, the strain upon the thread which passes over a hook or pin on each ring. The claim is to the arrangement and combination of the several parts described, and particularly to the construction of the rings.

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6. For an *Elevator, to be used in elevating Building Materials;* Charles G. Fairman, Lewiston, Niagara county, New York, December 16.

In this apparatus there is a frame, two of the upright posts of which must extend to the full height required for scaffolding; a cross beam connects these posts together at top, and supports two pulleys, over which ropes are to pass to raise one hod, or bucket, and to lower another. The ropes are to be acted upon by a windlass of the common construction, and which is attached to the lower part of the frame.

What there is new in this, excepting that the patentee exhibits in his drawing a neatly joined frame, tenoned and morticed together, we cannot tell; we have often seen bricks and mortar drawn up by ropes, operated on by a windlass, raising one vessel, and lowering another; but then the whole was unpatented, and there was no frame excepting that of the windlass; all the necessary apparatus being supported by the ordinary scaffolding of timbers, projecting from the building. Editors do not build; but were we able to do so, we would, if we pleased, raise our materials by a windlass and tackle, in spite of this and all other patents. We wish, however, that the patentee had vouchsafed to state his claim, that we might be in no danger of interfering even with the invisible part of his invention.

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7. For a *Medicated Shampoo Bath;* Richard D. Mott, Boston, Massachusetts; an alien, who has declared his intention of becoming a citizen of the United States, December 16.

This bath is said to be intended for "conveying into the human body the compounded medicinal virtues, and essential oils of herbs, by means of steam." The herbs are to be put into a tin case, perforated with holes, and the person is to be seated above this instrument, surrounded by a tent-like covering. A thermometer, flesh brush, and other suitable affairs are to be employed when necessary.

The patentee has not said a word about invention, and we will not pretend to decide that there is any thing new in any part of the process, or of the apparatus.

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8. For an improvement in the *Composition of, and mode of making Candles;* Philip Farrell, city of New York, December 16.

Twelve or fifteen pounds of white pine turpentine are to be mixed with one hundred pounds of melted tallow, the former being first boiled in water for two or three hours, to evaporate its oil, or spirits.

The discovery claimed is, the using of the above named composition, in lieu of tallow alone; and the improvement is in the comparative cheapness of the compound.

Would it not be better to take rosin at once in place of the turpentine? The boiling "for evaporating the oil or spirits," reduces it to the state of rosin, and wastes the spirits.

How new, or how old, this plan may be, we do not know, but have no doubt that were we to inquire among the negroes in the pine woods of North Carolina, we could find hundreds of them who have been in the habit of making a similar mixture.

9. For improvements in the *Puddling and Heating of Iron in the process of manufacturing it;* William Jones, Haverstraw, Rockland county, New York; an alien, who has resided two years in the United States, December 16.

We have rarely met with a patent for the full understanding of which a drawing was more necessary than that before us, as the invention consists in a furnace which is novel in its construction. It appears, however, that there is not either a model or a drawing of it in the patent office, notwithstanding the direct and positive requirements of the law, that the whole shall be accompanied "with drawings and written references whenever the nature of the case admits of drawings." If this omission would not be fatal in the present case, we know not where it would.

The improvement, we are told, consists of a stove, or heating apparatus, attached to, and connected with, a puddling furnace, which stove is to be heated by the fire that serves for working the furnace.

The furnace is to be divided into three compartments, communicating with each other. The coal, or fuel, apartment, the puddling apartment, and the stove or heating apartment, which is over the puddling apartment. The dimensions and construction of these several parts are described, with certain requisite arrangements, which require a drawing to make them clear. The flame from the fuel apartment is to be carried horizontally across the puddling apartment, and through a flue by which it is to reach the heating apartment. By this arrangement we are told "pig iron, refined metal, blooms, billets, bars, or other iron, cut into pieces about six inches in length by three inches diameter, is heated into nearly a melted state, and when so heated is conveyed through the aperture described, into the puddling apartment, and then wrought into balls, without the necessity of a fresh fire being put on."

The object of the inventor is, manifestly, to patent the peculiar construction of this furnace; he, however, has not told us so, but has left this to be inferred, as he has left the structure of his furnace to be imagined.

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10. For an improvement in his machine for *Cutting Straw, Hay, &c.*, patented March 9, 1833; James Luckey, city of New York, December 16.

In the machine as formerly patented by Mr. Luckey, the cutting knife was placed upon a plank, or frame, which vibrated horizontally below a vertical hopper; in the improvement now patented, knives are fixed upon a horizontal wheel, which is made to revolve, take the place of that first used.

We are informed that the invention now claimed "consists in the wheel of knives, as before described, for cutting straw, &c. whether these knives be attached to a circular rim of metal, &c. or be placed upon arms attached to the vertical axle, and loaded at their extremities, so as to act like a fly wheel, by increasing the momentum of the

machine; and doing away with the use of the crank and vibrating motion as in the former machine."

We noticed two machines in the last number, Nos. 27 and 58, in which the straw is placed in a vertical hopper, and the cutting effected by knives on a revolving cylinder beneath it.

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11. For a *Self-supplying Pen;* Charles Cleveland, Middlebury, Addison county, Vermont, December 16.

(It is intended to publish the specification of this patent in the next number.)

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12. For a *Method of forming and laying ropes by machinery;* George Bradley, Fishkill, Dutchess county, New York, December 16.

The description of the machinery here patented occupies a dozen pages of foolscap, referring throughout to a number of drawings, the whole being very clearly laid down. We can only give the claim, which is in the following words:—

"I claim that, as a combination, it is a new machine which has not heretofore been known or used. And I especially claim the invention of the revolving creel in which the bobbins of yarn are placed to be formed into the ready, and the revolving flanch, or circular guide plate, which twists and lays the thread in the ready before it passes the compressing tube; and the application of the machinery necessary for their support and motion as described. I specially claim also, the application of two shafts, or the insertion of one shaft into another, making thereby a compound shaft for the support of the combined wheel, (containing the three spindles,) which is susceptible of two quantities of motion, by which I give my spindle any desirable number of turns, while the ready, from them, is forming into rope. I also claim the invention of the shaft with the bevel gear and pulleys upon them upon the outer or forward end of the blank wheel, by which any inequality in the tension of the strands is regulated and equalized. And the arrangement of machinery by which the whole process of forming the ready, and laying the rope, is effected; and I claim them not only in the size and proportions as herein described, but for any size and proportions which may be useful in laying and making all kinds of cordage and ropes."

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13. For a *Cooking Stove;* Elisha Town, Montpelier, Washington county, Vermont, December 16.

The specification of this patent is not a description, as it merely tells what is claimed by the inventor; the drawing, however, which accompanies it, represents the stove clearly in one of its forms. The things claimed are, "First, the use of *cranes*, so constructed in the top as to be made the seats, or resting places, for pots, kettles, or other furniture in use about the stove, and by which they may be easily swung on or off the fire, thereby regulating the quantity of heat applied to them." These, so called, cranes, consist of a part of the upper

plate of the stone, with the requisite appurtenances, which swivel on a pin, allowing them, with the cooking utensil, to be drawn on one side. Second, the use of these plates between the oven and the fuel, to render the heat in the oven uniform. Third, the casting of a portion of the hearth, under the fuel, in a separate piece, to admit of its expansion and contraction. Fourth, a damper, or door, which is to slide up and down in front of the fire to regulate the draft, and to admit of toasting, &c. before it. Fifth, the general construction of the stove, admitting of the introduction of grates for the burning of coal, peat, or other fuel.

Sliding doors, to rise and fall in grooves, in the front of fires, are a very old contrivance, and this, at least, therefore, had better not have found a place among the things claimed as new.

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14. For a *Currying Knife;* John Glen and John Herd, Urbana, Champaign county, Ohio, December 16.

This knife is to be made of one piece of cast steel, and to be forged out without heating it above a blood red; it is then to be hardened by heating it slowly and regularly over a charcoal fire, using no blast but that of hand bellows; when hot enough to burn shavings, it is to be thrown into cold water, containing a pint of salt to every four gallons. It is to be tempered by placing it between plates of cast iron, heated so as to burn oil, and stout enough to retain the heat; the whole is to be gradually cooled together, when it is ready to be ground.

The whole process of manufacture is thus given, but without saying what in it is new; excepting that it is "made in a different way, and of a different composition from others, being entirely solid steel." Although curriers' knives are generally made of iron and steel combined, they have frequently been manufactured of cast steel exclusively; and as to the heating and tempering, there is in these nothing which we have not long known, and which, in its essential features, has not been practiced by workmen.

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15. For a *Seeding Cultivator;* John Richard, Guilford Township, Franklin county, Pennsylvania, December 16.

This is a modification of that species of harrow usually denominated a cultivator, and which, we are informed, operates well in practice. The frame of it is made triangular, each side being about seven feet long, and in drawing it along, one of the sides of the triangle becomes the forward part; two handles, like those of a plough, projecting from the hind angle. In this angle there is fixed a double, or wedge-formed mouldboard, provided with a share and coulter. This share and mouldboard project forward towards the front of the cultivator, and serve to divide the lands. In each of the side pieces of the frame there are ten teeth, each about four inches wide, and made in the usual form; they are placed so as to stand at right angles with the sides, and therefore, obliquely to the line of their motion.

"In using this instrument the ground is first prepared by ploughing

and harrowing in the usual way. When this has been done, and the seed sown, the land is staked off at distances of a little upwards of seven feet; the stakes serving as guides for the centre, or plough, part of the cultivator, and the teeth on the sides then form the ground into furrows of the most convenient and suitable width for the advantageous growth of the grain."

The claim is not to any of the individual parts, but to that general arrangement and combination of them which gives to this machine its individual character. "A principal feature by which it is thus distinguished, being the reversed direction in which the triangle is drawn forward; and the fixture of the double mouldboard and its appendages, by which the lands are divided."

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16. For an improvement in the *Construction of Spectacles;* Joseph Richards, city of New York, December 16.

There are to be springs in the temple joints of these spectacles, which, by their action, will keep the temple bows closed when the spectacles are not in use, and will clasp the temples with sufficient firmness when they are on. The temple joints may be small barrels, and the springs a few coils of a watch spring. When thus made, the second joint, it is said, may be dispensed with, and the whole be made lighter than spectacles usually are. "The only thing that the applicant claims, is, the application of the spring to the temple joints of spectacles."

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17. For an improvement in the *Hydrant;* Jacob Stroop, Allegheny, Allegheny county, Pennsylvania, December 16.

This apparatus is precisely the same in principle with that patented by Newton and Laning, on the 30th of July last. There are some nonessential differences in them in point of arrangement, but the conclusion is irresistible, that one is the offspring of the other; although which is the parent, and which the child, belongs not to us to determine, nor have we the means of doing so.

We have, in the present number, given the specification of that patented by Newton and Laning, with an engraving exhibiting the manner in which the waste water is made to retire from the pipe, into a reservoir provided for that purpose, and again made to fill the discharge pipe, by the descent of a plunger, when water is to be drawn. This is the essential feature of the apparatus; the distinguishing characteristic of the invention; and it was to this part that we alluded when we said that the machine now patented is the same with that of Newton and Laning.

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18. For a *Machine for Cutting Straw, Hay, Tobacco, &c.;* James Secor, Bristol, Bucks county, Pennsylvania, December 16.

The knife in this machine is fixed like that noticed in the patent of Mr. John Shaw, p. 323. The straw, &c. is to be contained in a trough, and advanced by feed rollers, a balance wheel on a crank shaft regulating the motion, and turning the feed rollers by a feed hand acting

upon a ratchet wheel. Instead of the fly wheel, we are told that a pendulum may be employed.

Although there is no novelty in any part of the machine, taken separately, and scarcely any in its combination, the patentee has found much to claim, as will appear from the following quotation.

"What I claim as my own invention is the application of the lever in the manner described; the application of the friction rollers, for the purpose described; the manner of using the feed rollers, with the vertical knife, and mode of operating them; the application of the balance wheel; the vertical cutter, and the application of a pendulum for a balance."

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19. For a *Water Wheel;* Isaac Van Gorder, Warren, Trumbull county, Ohio, December 16.

This is a wheel said to be acted upon by the percussion, gravitation, and reaction of the water applied to it. The wheel is to be contained in a chest or flume, in the manner of those called reaction wheels, but the water, instead of escaping from its periphery, as in most of them, escapes at the under side of it, supposing its axis to stand vertically. The wheel is to be solid in the centre, and may consist of a circular piece of timber, two feet in diameter, and eight inches thick; around the edge of this are to be placed the buckets, of which there may be about twenty, so curved that they shall deliver the water below as nearly as may be in a horizontal direction; they may be two inches and a half broad. This wheel is to run within a circular case, or curb, and the water is to be admitted on to the buckets through openings above them, inclined in a contrary direction to the curvature of the buckets, and corresponding with them in number.

The claims made are to the construction of such a wheel, to run in a curb, or cylinder, protected by a platform, or guard, from the weight, or pressure of the column of water employed, the manner of applying the water at the periphery, through shutes, or guides, placed in a projecting platform, within a flume; together with some other incidental appurtenances.

We do not perceive in what sense it can be said that the water in this wheel acts by *gravitation*, *percussion*, and *reaction;* we consider these as merely different names applied to particular modes of action, all derived from the same power, gravitation, and that there is no mode in which the effect of this power may be twice told. In the wheel itself, there is little or no novelty.

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20. For *Tanning Skins, or Hides;* George H. Richards, city of New York, December 16.

This improvement in tanning is said to consist in applying the tanning liquor to the prepared skins, by exhausting the air from the vessel which contains them, so that the liquid may be made to ooze through them by atmospheric pressure. Different, but analogous, modes of effecting this, are described in the specification; and a claim is then made to "the plan of exhausting the air from skins and hides,

and thus opening their pores, and while in that state applying the tanning liquor to them; and by this means, and also by means of atmospheric pressure causing the liquor speedily and thoroughly to penetrate the hide, or skin, in such manner as rapidly and effectually to bring it into leather."

The principle upon which the above process depends, has been long known, and extensively practiced. At p. 418, vol. x. there is an article upon this subject extracted from Babbage's Economy of Machinery and Manufactures, in which this procedure is explained. We could point to several other sources for similar information, and among them, to a patent obtained about two years since, by a citizen of New York, for a mode of exhausting vats by hydrostatic pressure, and upon which we made some animadversions.

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21. For a *Machine for Hulling and Polishing Rice;* John W. Walker, Madison, Morgan county, Georgia, December 16.

There are to be two circular rubbers, one of which is to be stationary, and the other to revolve. They are to be fixed in a suitable frame, with the axis of the rubbers horizontal. The rice is to be fed through an opening in the stationary rubber, which conducts it near to the centre of the two rubbers. Both these rubbers are to be covered with leather, and that which revolves is to have tacks, or points, driven into it, in any suitable number or direction. The claim is to the "lining the cylindrical rubbers with leather, and studding the revolving rubber with tacks, or nails, placed in a spiral, or other, direction, for carrying the rice to the outside, or rim, of the rubbers.

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22. For an improvement in the construction of the *Thrashing Machine;* Daniel A. Webster, city of New York, December 16.

The improvement claimed consists in the mode of "placing plain or fluted rollers of metal, or wood, as beaters on the cylinder of the common thrashing machine, having springs placed against the back of each beater, and in the manner of adjusting the cylinder."

The beaters may be four, or more, in number; they are to stand at the distance of about an inch and a half from the cylinder, and to have axes in their ends inserted into sliding pieces, borne out by springs, but permitting the beaters to approach the cylinder in a degree proportioned to the quantity of the material between them and the concave.

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23. For an improvement in the common *Gopher Plough;* Thomas Carter, Laurens District, South Carolina, December 16.

The improvement claimed consists in a blade or plate of iron, operating as the shovel plough, but so formed that, according to the statement of the patentee, it will throw all the clods and rough matter from the young corn that is ploughed with it; operating much in the manner of the hoe, and superseding, to a great extent, the use of that instrument.

The drawing does not very clearly exhibit the particular construction of this part, and the *model* is referred to for further information.

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24. For *Making Iron and Steel, by the use of anthracite coal;* F. W. Geissenhainer, city of New York, December 19.

The smelting of iron from the ore into pig, or cast iron; the carbonating and refining this into malleable iron; the combining iron in a metallic state with a greater quantity of carbon, if bar iron, for steel; if white pig, or cast iron, for a superior quality; are all to be effected under this patent, by means of anthracite coal.

The patentee states that he has discovered the true principle, heretofore unknown, of applying anthracite to the purpose of smelting, &c.; and we sincerely hope that he may find his theory, or rather his practice, correct. The conversion of iron into steel may, he says, be effected by stratifying the iron with small pieces, or dust, of anthracite, in a cementing furnace, or in suitable vessels; anthracite being also used for heating the materials.

The aptness of anthracite to fuse and run together in a moderately high temperature, the patentee denominates its *continuity*, and he claims to have discovered that this tendency is counteracted by a greatly increased temperature, which must be excited by applying in an appropriate blast furnace, a stream or portion of air, in such quantity, velocity, or density, as shall correspond with the excess of density, compactness, and continuity. Thus, if we suppose the density of charcoal, to the coke of bituminous coal, to be as two and a half to one; and of coke to anthracite, to be as two and a half to three and a half. the quantity, velocity, or density of the blast, must be in these proportions. " By this illustration," we are told that " the true principle and manner of smelting iron ore with anthracite coal is fully explained.

The claims are made under six distinct heads. First, the application of anthracite coal to the deoxidizing and carbonating of iron ore. Secondly, to the combining iron in a metallic state, with a greater quantity of carbon, if bar iron for steel; or if pig iron. to render it of a superior quality. Thirdly, the smelting or reducing iron so deoxidized and carbonated, by anthracite coal. Fourthly, the refining cast into bar iron, by the same material. Fifthly, the applying of the blast upon the principle specified, for the smelting of iron ore. Sixthly, the applying heated air to the purpose of smelting; not to the fact itself as a discovery, but to the using heated air in conjunction, or combination, with the process, or principle, of procedure, explained in the specification.

We have thus given a general epitome of this specification; but think that the instrument itself is deficient in those practical details which are requisite to enable any one to follow the process described. It leaves an impression upon the mind that they have not been fully carried out by the patentee, or that he is not anxious to enable others to do so. This remark does not apply to the general principle of the

increase of the blast, although we think the defect pervades most of the operations alluded to.

25. For an improvement in the mode of *Generating Steam;* Isaiah Jennings, city of Philadelphia, December 19.
(See specification.)

26. For an improvement on the *Plough* patented by Mr. Barnard; Peter Hastings, Dogsboro', Sussex county, Delaware, December 19.

The improvement made "consists in casting the movable share and landside sufficiently deep to protect the front of the mouldboard from most of the wear to which it is exposed by his [Barnard's] plan."

We do not think it worth while to give the particulars, or to inquire whether the present patentee has acquired the right to the plough which he claims to have improved; this is a question that does not concern us, but it may concern some of our readers to know that they have no more right to another man's machine, because they may have improved it, than they would have to a neighbour's house because they had painted his door, or mended his window.

27. For a *Plough;* Joseph P. Sharp, Geneseo, Livingston county, New York, December 20.

The points which are here considered as constituting the improvements, are, the particular form given to the mouldboard; the manner of fastening this and the other parts together, and of attaching the handles to the plough.

The former is illustrated by diagrams, but the latter are merely described, without being exhibited by drawings; and in this respect, therefore, the law is not complied with. As regards the form of the mouldboard, we are apprehensive that there are in the numerous variations of this part, some made either by accident, or by design, which would come very near to that claimed, and in practice operate like it. The particular curves and angles upon which its form depends, may also be departed from, and an instrument produced which, although in effect similar, would still not be embraced by the description before us, which is confined to minute particulars.

28. For a *Machine for Hulling Cotton Seed, and Rice, and Grinding the Hulled Kernel;* Noel Mixon, Madison, Morgan county, Georgia, December 20.

On looking at the drawing accompanying this specification, we thought that we had, by mistake, obtained that belonging to the machine No. 21, which is from the same place, and for a similar purpose; they, in fact, do not appear to be mere neighbours, but absolutely twin brothers. In the present case, however, the leather is omitted, but the stationary and revolving disks, the spikes, and the

feeding, are identical. There is no claim made, nor are we informed in what way the machine is to grind the kernel.

29. For an improvement in the *Grist Mill;* Adna Norcross, Hallowell, Kennebeck county, Maine, December 23.

One stone is to be made concave, like a bowl, and the other convex, to fit into it; this latter has a shaft through it, fixed horizontally on a frame, the concave stone being, of course, placed on its edge; and an opening is made in the upper side of it, through which to feed the grain.

Such mills have been made and patented before.

30. For a *Truss;* James M'Chesney, city of New York, December 23.

The claims to improvement in this truss are "to the packing and unpacking, and fastening the rupture pad at pleasure, and to the fastening and fixing the ball in the socket."

The front, or rupture pad, is covered with leather, which is fastened round a ring, forming the periphery of the pad. There is a back plate screwed on to this ring, by small screws, and when these are removed the pad may be packed so as to give it the desired form. The spring is attached to the centre of this plate by a ball and socket, which may either play loosely, or be fixed in any required position, by screws passing through the socket, and bearing upon the ball.

The drawings are good, but there are no written references to them, as by law required.

31. For an economical mode of *Applying Water Power;* Timothy P. Anderson, Hardwick, Worcester county, Massachusetts, December 23.

The water is to be conducted through a close trough, or spout, from the lower side of a flume, so as to surround the water wheel. This wheel stands on the lower end of a vertical shaft, and consists of six leaves, or buckets, formed like those of a smoke jack, having openings of about two inches, and lapping over each other so as to deliver the water in a direction nearly horizontal. The end of the spout which surrounds the wheel, is to decrease in height in its circuit, and this, it is strangely enough imagined, will influence the pressure of the water on the wheel. If the wheel was placed in an opening in the bottom of the flume, it would be more simple and equally efficient, but still it would *not* "make a valuable saving of water," as the patentee believes his will.

32. For a machine for *Dressing Woollen Cloths and Sattinetts;* Stephen R. Packhurst, Mendon, Worcester county, Massachusetts, December 23.

The claim made in this machine is to the combination of the several parts described in the specification, by which, among other advan-

tages, will be that of the saving much of the labour and expense which are encountered in the process usually followed. We are informed that when it is used, "The cloth may be taken from the fulling, or rinsing, mill, and stretched, made smooth for napping, napped, steamed, and dried ready for shearing, by simply passing it through the machine, thereby saving its being passed through several hands, and operations, to accomplish the same purpose."

There are to be six principal rollers mounted in a frame, and moved by proper gearing; two of them, called the winding rollers, are to receive the piece so that it may be alternately wound from one to the other; in doing which it is passed through two pair of rollers, which are pressed together by suitable means. Above the cloth, and between the pairs of main rollers, are placed two napping cylinders, covered with card teeth, or teazles; these do not touch the cloth, excepting when it is borne up against them by an apparatus acting upon it for that purpose. There is attached to the machine a stove, or heating apparatus, the main flue, or body, of which is placed below the cloth, in such a manner that the water which is squeezed out of it by the rollers, shall fall upon the surface of said stove, and be thus converted into steam; which, it is said, will, in most cases, be sufficient for the steaming of the cloth.

It will be seen by those acquainted with the dressing of cloth, that there is nothing new in the principles involved in the application of this machine, and the claim is, therefore, very properly confined to the particular combination and arrangement of its various parts, so that the whole, or any required number of the operations, may be simultaneously performed.

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33. For a *Horse Power;* Benjamin D. Beecher, Cheshire, New Haven county, Connecticut, December 23.

The shaft to which the horse is geared is made conical, the base of the cone being at the outer end, towards the horse, where it is supported upon a circular rail-way, on which it rolls as the horse moves round. A bevel wheel on its smaller end, near the centre of the circle, gives motion to a train of wheels which drive a horizontal shaft, placed in a trough under the horse walk. The claim is to the "rolling shaft, or wheel, on a smooth surface, and the manner of constructing and operating the machine."

A patent has been previously obtained for machinery operating in the same way; but as we do not believe that the right is worth disputing about, we shall not at present take the time to examine into its date; said patent, however, was granted about two years ago.

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34. For *Applying the Power of Horses, or other Animals, to propel Machinery;* John and Luke Hale, Hollis, Hillsborough county, New Hampshire, December 24.

The horse is to stand upon an inclined revolving platform, constructed of plank in the usual way; around the rollers which sustain this floor, endless chains pass, and form a part of its support. These

are very obscurely described, and not at all represented in the drawing, which is also without "written references." The claim is to "the manner of supporting the platform," which, for aught we know, may be very good.

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35. For an improvement in the mode of *Removing the refuse Bark from the Leaches used in Tanning*; Harvey W. Babcock, Cooperstown, Otsego county, New York, December 24.

"The improvement claimed, and for which letters patent are petitioned, is the right of emptying the refuse bark from the leaches used in tanning, by means of plugs, valves, or sliding gates, in the bottom, sides, or ends, by water let in at the top, sides, or ends, as the situation of the leaches, and the water will admit."

There are but few tan vats, or leaches, so situated as to allow of the bark being thus washed out; the mode of doing this, however, where it is admissible, is so obvious, as to render it highly probable that it has been before known and used.

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36. For a *Machine for Sawing Marble, Stone, or Wood;* Charles B. Austin, Kensington, Philadelphia county, Pennsylvania, December 24.

An endless belt of metal is to pass round drums upon revolving shafts. When stone is to be sawed, the metal belt may be of iron, copper, or other suitable metal, the edges being smooth, and supplied with sand and water as the stone is moved up against it by a suitable carriage. When wood is to be sawed, the belt must be of steel, and toothed. It is proposed, also, to punch holes through the belt, to receive corresponding pins upon the drums, and thus to prevent slipping.

Under the article *Sawing*, in Rees' Cyclopedia, it is mentioned that a patent had been obtained for sawing by "an endless steel band, or blade, extended over two wheels placed at a distance asunder, just like the endless straps which are used to communicate motion from one wheel to another." And, in the same article, that there was "invented by one Misson, inspector of the marble quarries in the Pyrennes, a kind of long saws, by means of which stones are sawed, even in the rock itself; some of them were made twenty-three feet long; but neither their form or application is described; it being only said that they were of iron, and without teeth."

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37. For an improvement in the *Still;* Elias Herr, Lampeter T. S., Lancaster county, Pennsylvania, December 24.

The improvement in the still consists in extending the neck to the height of six or eight feet, gradually tapering from the top of the still to the bend where it leads off to the refrigerator.

Stills with high necks are no novelties, but have often been prescribed and used when it has been desired to draw off high wines at a single operation. "The doubler is placed in a tub, or box, sur-

rounded with sand, which being heated by the doubler retains the heat, and assists in the operation." This sand heat is equally new with the long neck; and as these are the only things mentioned, we infer that it is intended to claim them, although nothing is said upon this subject.

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38. For a machine for *Cleaning Clover Seed;* George Hassinger, William Stees, and William Kuhn, Union county, Pennsylvania, December 24.

This machine is to be formed much like that noticed in No. 28, for hulling rice, &c., and we might add, like a great many others. Two circular disks, or rubbers, are to be placed vertically in a suitable frame, one of them to revolve, the other to be stationary; for a few inches from the periphery they are to be flat, and thence to the centre a little concave. The seed is to be fed in through the stationary disk, just above its centre; the disks may be of stone, metal, or wood, but in the latter case, they are to be covered with punched iron, or rendered rough in any other suitable way. If we admit the evidence of the patentees, "This differs from all other machines, in its operation and application."

The science which investigates the operations of the human mind is equally interesting and difficult; the objects of its inquiry are neither ocular nor tangible; nor is it presented with those images which render mathematical investigations demonstrative; such being the case, it is not surprising that we should be at some loss in perceiving how three minds have concurred in elaborating this machine for the rubbing out of clover seed; such, however, appears to be the fact, the thing being verified under oath.

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39. For a *Machine for Cleaning Clover Seed;* Christian Landes, Mount Sidney, Augusta county, Virginia, December 24.

There are to be four, or any other convenient number of rollers, of suitable size and length, placed near to each other, their gudgeons resting upon a frame which forms an inclined plane. The rollers are to have teeth in them, so placed that in revolving they will not interfere with each other; and below them are to be concave beds, also furnished with teeth; a cover placed over the whole, prevents the escape of the seed.

The feeding is to be effected by an endless, revolving apron, and the seed and hulls are to be received upon a vibrating riddle. The invention is said to consist in "the peculiar arrangement of the several parts of the above described machine for hulling clover seed; particularly the arrangement of the rollers and beds filled with pins, or points; the cover over the rollers, and the vibrating screen."

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40. For an improvement in the *Ridging Plough;* William Atwood, and Daniel Hamblett, Cornish, Sullivan county, New Hampshire, December 24.

The share of this plough is to be made "in the Dutch form," so fitted as to turn the furrow right and left. It is to have a bar across from wing to wing of the share, through which a bolt passes up through the beam. The wood also, is to be "in the Dutch form," but is to have a left hand mouldboard added, and the handles are to be fastened to the mouldboards; it is then ready to ridge land for summer tilling.

There is a drawing of the plough, but it is without references; and the specification is without a claim; our principal information respecting it, therefore, is, that there is much that is Dutch about it; whilst what we desire most to learn is, how much of it may be claimed as American; not that we are any more disposed than the patentee to think lightly of the Dutch part, which he certainly would not have adopted had he not found it good.

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41. For an improvement in the cast iron *Plough;* Anthony Taylor, Green Township, Columbia county, Ohio, December 26.

The improvements that are claimed in this plough, consist in the form given to certain parts, and the manner of putting them together. The coulter is to form a part of the share, instead of being made in a separate piece. The horizontal surface of the mouldboard, instead of being straight, is to be "nearly spherical," to facilitate the breaking of the turf. The mouldboard is to be continued up to the beam, so as to form a bolt passing through it, having a shoulder to fix it firmly. There is to be no concavity between the angle of the share and coulter and the rear point, on the front side of the mouldboard, which enables it to enter the ground as an inclined plane. "All the above specified improvements I allege to be of my own invention;" an allegation, by the way, the truth of which admits of some doubt.

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42. For an *Anthracite Coal Burner;* James L. Alney, Providence, Providence county, Rhode Island, December 26.

Although the patentee has taken much pains to describe his stove, and has furnished a very good drawing with written references; and has, moreover, informed us in what his claims consist, we are at a loss in selecting for our readers the points of novelty. It may be sometimes judicious, where there is little that is novel, to admit of some obscurity; as in that case the imagination is left free to act, and may come in to the aid of the inventor.

The stove is to be of cast iron, and we are furnished with two views of it, one in the Grecian, and the other in the Gothic style of architecture. There is a top vessel for containing water, and on removing this, fuel may be supplied to the *chamber of combustion*, forming the base of a pyramidal, or conical, stove body, the lower part of which is lined with fire clay.

The following is an abstract of the advantages offered by this stove, as set forth by the patentee. They consist "chiefly, in having the chamber of combustion lined with fire clay, by which the caloric is retained, or distributed in the most economical manner. Whilst the

upper chamber being of cast iron only, suffers the heat to pass quickly through it to warm the room. Besides, the nonconducting, or clay, lining at the bottom of the chamber of combustion, enables you to preserve fire in a very small quantity, if necessary, and for a very long time." These are most undoubtedly real advantages, as has been fully proved ever since anthracite coal has been introduced as an article of general consumption; what these observations, therefore, may lack in originality, they must be allowed to make up in truth.

The claims are to "the peculiar construction of the anthracite coal burners, and their several parts as before described; and particularly *the lining of the chamber of combustion with fire clay*, so as to retain or to distribute the caloric or heat with the greatest economy; also the manner of fitting the door, or blower, to make part of the hearth when turned down."

The part italicised has been so distinguished by us.

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43. For a *Scrubbing Machine;* Thomas Rickey, Greenfield, Highland county, Ohio, December 26.

We have looked very carefully through the papers of this patent to learn what was intended to be scrubbed by the aid of this new machine, but have not succeeded in our researches; as floors, however, are the most frequent subjects of this process, we infer that these are the things to be acted upon by it; although, judging from the drawing and description, the apparatus is rather a formidable one for this purpose. The description is very obscure; but the drawing represents a sort of box, having a scrubbing cylinder placed across it at the angle formed by one end and the bottom of it. This cylinder is to be about two feet long, and five inches in diameter, "said roller to have husks fastened round it for the purpose of scrubbing." Motion is to be given to it by a wheel and band, from a band wheel: above the cylinder is a box to contain "scrubbing materials," with small holes in the bottom of it to allow them to drip through upon the cylinder; and behind it there is an endless apron passing round two rollers, one above the other, the lower one keeping the cloth in contact with the floor, that it may wipe up after the scrubber. A scraper, or something of that kind, is to take the water and dirt from the apron, and conduct it into a box. Whether the machine is to be moved by steam or horse power is not told us; we predict, however, that after it has been once tried, it will share the fate of the various perpetual motion machines, and come to a stand still.

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44. For a machine for *Making Rivets, Heading Wood Screws, and for cutting and punching metals;* Enoch Scott, Rochester, Monroe county, New York, December 26.

This is a machine, the parts of which are fixed in a strong iron frame; the cutting, punching, and heading apparatus being worked backward and forward by motion communicated from a crank shaft, to a stout iron lever; and by cams, &c. where required. The machine

is well represented in the drawing, although the description is but an indifferent one, and neglects altogether to inform us what is new in the machine; and as similar operations are performed by analogous means in other machines, we are left at a complete loss on this point; in fact, we see nothing that could have been claimed excepting the particular combination and arrangement of the parts.

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45. For a method of *Hanging House Bells;* Seth Fuller, city of Boston, Massachusetts, December 26.

"The improvements particularly claimed are, the construction of the *box* to inclose the bell,—the substitution of the stationary clock bell for the common house bell, and the application of the *box, cylinder, lever, friction roller, staple, clock bell, crooked spring hammer, springs, wires, strings, and vibrating plate,* to produce a sound and motion so definite and distinct as to draw the attention of those interested, to the proper point, without unnecessary noise, waste of room, or injury to the appearance of the room where the bells may be placed."

The bell, as will be perceived, is to be the common hemispherical clock bell, which is to be struck by a hammer; two strokes being given by the tipping of the hammer by a lever which passes backward and forward when pulled. A tin plate suspended by a wire from the lower part of the lever, has a number marked upon it, and by its vibrations indicates which bell has been struck.

The box, and various other things described and claimed, are not represented in the drawings as they ought to have been to fulfil the intention and requirements of the law; and although the specification is drawn up with care, it is deficient in clearness, not conveying to the reader the ideas existing in the mind of the writer; this defect would have been remedied by proper drawings.

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46. For a *Machine for Breaking Corn;* Webber Furbish. First patented March 15, 1833. Patent surrendered and reissued, December 26.

We noticed the former patent in due course; the claim now made is to "the employment of indented and plain rollers, or of indented rollers, or of indented rollers and a suitable concave segment, so arranged, upon the principle, or in the manner set forth, as to form a machine to be employed for the breaking, or cracking, of corn."

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47. For improved *Metallic Pumps;* Jedediah Beckwith, Saratoga, Saratoga county, New York, December 27.

When patents are obtained for pumps, we rarely look for novelty in the things claimed, and if the patentee had, in the case before us, claimed any thing, he would not have presented an exception to this rule; he, however, has merely given us references to the drawing, which represents two chambers, with their pistons moved by a rack and pinion, the handle being a pendulum attached to the pinion.

48. For a piece of furniture called a *Stand;* Ezra Riply, city of Schenectady, New York, December 27.

This "*Stand*" is to be like other stands in form, but not in material, as, instead of wood, it is to be made of cast iron, or other metal. The one represented in the drawing, is a tripod, with a rim at the top suitable for a wash hand bowl, but they are to be of any required form. The principal advantage stated, is the ornamental embellishments, in the manner of carving, &c., which such a stand may receive at little cost, and its light appearance with great strength.

We have seen cast iron tripods, much like the one drawn, placed on the blocking of a portico, to hold a lamp, and if this patent is good, should the owner carry one of these in doors, and use it as a wash-hand stand, he must buy a right. We have also seen metallic "stands, or tables," imported from France, usually of brass, and neatly ornamented. Independently of all this, however, we should very much doubt the validity of a patent for a mere change of material.

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49. For *Setting Kettles for Boiling Sugar;* Joshua Jordan, city of Boston, Massachusetts, December 27.

The patentee calls his contrivance "the damper sugar furnace," and states that it comprises "an improvement in the mode of constructing sugar furnaces and setting kettles for manufacturing sugar, so as to prevent the sugar from burning during the operation of striking, or removing the same from the granulating kettles to the coolers, and for other purposes therewith connected." The principal object in view, however, is the preventing of the burning of the sugar in striking.

In constructing the furnace, the fire is made to pass directly under, and through a flue around the granulating kettle, before it reaches that for evaporating, so that, by means of the damper, it can be prevented from acting on the granulating, without interfering with its operation on the evaporating and clarifying kettles, while the striking is going on.

Between the bottom of the granulating kettle, and the fire, a damper of a peculiar construction is to be introduced during the striking. This damper is a vessel of copper, made flat in the form of an oblong square, of sufficient width and length to cover the fire, and hollow so as to contain water in the cavity formed between its flat sides, which water cannot escape excepting through a safety tube, extending up from its outer end. Above the furnace door, there is another close to the bottom of the kettle, and of such size that when open, the damper can be passed through the opening. This damper is placed upon a carriage, which runs upon a rail-way, in front of the furnace, and when wanted it is brought up, and slid in through the opening, from off the carriage; the same serving to remove it when it is no longer wanted.

Another damper, similarly constructed, is placed vertically between the granulating and evaporating kettles. When this is down in its place, the fire passes freely through a suitable opening in it for

that purpose, but when raised, by the aid of pulleys, the opening between the two kettles is closed by an imperforated part of the damper.

There are in the drawing a number of the parts of the furnace represented, which are without written references; the general plan, however, is sufficiently apparent, although no specific claim is made.

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50. For a *Machine for Dressing Staves;* Ebenezer Gregg, Derry, Rockingham county, New Hampshire, December 27.

This machine contains circular saws for cutting the staves to a length; a heavy wheel with cutters on its periphery for dressing the hollow side of the stave; an apparatus for receiving it afterwards, dressing the opposite side, and jointing it, all of which, taken together, has an appearance of much complexity; it, however, is well represented in a drawing, to which there are numerous and full references, and in these its description principally consists.

The claims made are to "the application of the balance wheel with cutters; the flyers with concave edges, and the particular manner in which the rolls are placed and regulated; the application of the saws for cutting off the ends, and jointing the staves; the form of the racks, the swing box, and other apparatus regulating and guiding the saws; the particular manner in which the saws are applied for the purposes set forth, and operating in the way described."

It may be doubted whether some of the particulars claimed can be sustained as original, although, as combined together, and forming the machine described, they may legitimately constitute a new invention.

[TO BE CONTINUED.]

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for an improved Hydrant, in which the water is prevented from freezing in winter, and the waste pipe is altogether dispensed with. Granted to THOMAS W. NEWTON *and* JOSEPH H. LANING, *city of Philadelphia, July* 30, 1833.

Attached to the end of the pipe that draws or conducts the water, is a large hollow male screw, the calibre, or hole, through the screw to be about the same, and attached so as to correspond with that of the pipe. There is a small cylinder, or chamber, attached to the male screw, the calibre of which, where it joins the screw, and for a small distance up, is to be from a half inch, or more, larger than the calibre of pipe and screw to form a chamber suitable for the spiral spring and valve; the valve seat is formed by bringing the calibre again to that of the pipe.

The calibre of the cylinder, or chamber, immediately above the valve seat, is to be two, three, four, or more inches in diameter, for a piston, or plunger, to work in, and to draw the water down out of the hydrant low enough to prevent its freezing in cold weather. The piston, or plunger, is raised to draw the water down out of the

pipe, with a rod attached to it, and to one end of a small lever working on a fulcrum, with a weight on the opposite end. The valve is opened by a small rod, or pin, in the valve, or piston, or plunger, when the piston, or plunger, is caused to descend by raising the lever; and closes by the force of the spiral spring and the water, when the piston, or plunger, is allowed to raise again by the action of the lever, and the weight on the opposite end.

If it should be found necessary, or more convenient, there may be two long staples linked together, and attached one to the valve, the other to the piston, so that when the piston, or plunger, descends, they will open the valve at the proper time, and when it ascends they will close the valve more securely, and prevent the piston, or plunger, from ascending more than necessary for the purpose of drawing the water down out of the hydrant, or discharging itself.

We claim as our invention, or discovery, the above described mode of constructing, combining, and applying to the use of hydrants, for the purposes described and intended, the hollow cylinder, or chamber, piston or plunger, lever, spiral spring, and valve, without regard to proportion or size, as that may be varied according to circumstances and places.

Thomas W. Newton,
J. H. Laning.

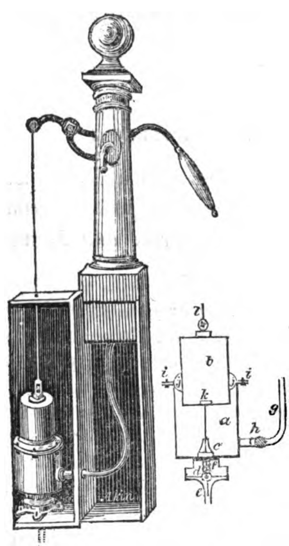


Fig. 1. *Fig.* 2.

Fig. 1. Hydrant in the ground.

Fig. 2, Cylinder to contain the waste water.

a, Cylinder to contain waste water.
b, Plunger.
c, Valve.
d, Spiral spring.
e, Service pipe.
f, Leather washer for valve to work against.
g, Draw pipe.
h, Coupling box to connect draw pipe to cylinder.
i i, Flanch to press packing to cylinder.
j j, Hemp packing.
k, Nut on valve stem.
l, Connecting rod.

Specification of a patent for an improvement in the mode of generating steam in steam engine and other boilers. Granted to Isaiah Jennings, *of the city of Philadelphia, December* 19, 1833.

To all whom it may concern, be it known, that I, Isaiah Jennings, of the city of Philadelphia, have made an improvement in the mode of generating steam, in steam engine and other boilers, by which improvement both economy and safety are attained; and that the following is a full and exact description thereof:—

I make use of such boilers as are generally employed, my improvement not being in any way dependent on the particular form thereof, but upon the manner in which such boilers are filled, or charged with water, in combination with other substances. My invention principally consists in the placing within a boiler spongy, porous, or solid substances of various kinds, so as to fill, or nearly to fill, its internal cavity, with the exception of the spaces between, or within, such substances. As, for example, I prepare globular, or irregular lumps, of wood, of such diameter as may be found convenient, say from three inches to one foot, or more, in diameter; or, instead of balls, I use pipes, or round sticks of wood, perforated with holes; which sticks, or pipes, are to be piled within, and along the boiler, until it is filled, or nearly so. Instead of wood I sometimes employ reeds, canes, or stalks of various kinds; taking care, however, that the substance be such as will not be readily reduced to pulp by boiling in water. I sometimes prevent the vegetable or other substances so placed within the boiler from coming in direct contact therewith, leaving a cavity all around them, to be occupied by water, which may be done in various ways. Let there, for example, be cylindrical boilers, in which this is to be done; I make a cylindrical vessel of wood, cut and fixed together like the staves of a barrel; this cylinder may be three or four inches less in diameter than the interior of the boiler; it should be perforated with holes, and is to have spikes, or pins, driven into it, over its outside, extending out, so as to bear against the sides of the boiler; this will leave a space as above mentioned, of from one inch and a half to two inches, more or less, between the wood and the metal. The wooden cylinder is to be filled with blocks of wood, or other materials, in the way already described.

For steam boilers used on land, where an increased weight is not objectionable, I sometimes use more solid materials than wood; such, for example, as large pebble stones, which, although they do not possess all the advantages of porous substances, yet, from their durability, will, in many cases, be preferred.

The increased surface obtained by thus charging the boilers, especially when the softer and more porous woods are employed, occasions a great increase in the production of steam, exceeding, it is believed, that which can be safely obtained by any other arrangement where the actual quantity of water within the boiler is so small as in that above described. For filling with water, I use such supply

pumps, or other means, as are already known; and add a steam chamber, or such other appendages as may be found convenient.

What I claim as my invention, and for which I ask a patent, is the placing within boilers of the ordinary construction, materials such as I have described, or others calculated to produce a similar result, which shall occupy the larger portion of the capacity of such boilers, whilst sufficient space is left between the touching points of, and the cavities within, such substances to contain the quantity of water which may be requisite for the generation of steam.

Isaiah Jennings.

ENGLISH PATENTS.

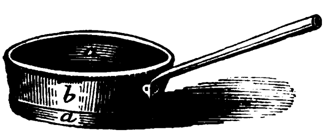
Specification of a patent granted to Christopher P. Bancks, *Brass Founder, for an improvement in the Manufacture of certain culinary and chemical utensils and vessels. Dated June* 29, 1833.

To all to whom these presents shall come, &c. &c. Now know ye, that in compliance with the said proviso, I, the said Christopher P. Bancks, do hereby declare, that the nature of my said invention, and the manner in which the same is to be performed, are particularly described and ascertained in and by the following description thereof, that is to say:

My improvement in the manufacture of certain culinary and chemical utensils and vessels, consists in protecting or strengthening such vessels, when made or formed of zinc, and are intended for utensils or vessels of capacity, and to be submitted to the action of fire in boiling liquids; or to be used for any other similar purpose where they are likely to be injured by heat. And my improvement in strengthening and protecting such vessels, consists in casing or covering them, either wholly or partially, with thin sheet copper, iron, tin plate, brass, either soldered or riveted to the vessels, and which I perform in several different ways; that which I most prefer for vessels of small capacity I shall first describe.

I make or construct a shell or outer casing from thin sheet copper, iron, tin plate, brass, or other thin sheet metals, of the proper size and shape required, either by hammering, stamping, or raising, or by uniting the sides and bottom by riveting, soldering, or otherwise; I then cover the inside of this shell or outer casing, with tin, in the ordinary manner of tinning; I then place into the tinned shell or case a core, suspended or placed in such a way as to leave a small space all round it, between the surface of the core, and the inside of the case or shell, the width of the space being of the thickness of metal required to form the inner vessel; I then run or cast into the space, zinc, in a state of fusion, which fluid zinc will melt or fuse the tin on the inside of the case or shell, and cause it to act as a solder between the zinc and the shell, or casing, and cause the two to adhere firmly together; and after the zinc has become cold and hard, the case is removed, and the inside of the vessel turned to produce a smooth sur-

face, in the usual way, and then the handles, spouts, or other outer parts may be attached by rivets in the ordinary manner. In some instances, I have found it desirable to alloy the zinc with a small portion of tin, say ten per cent., by which the zinc is made closer in grain, and does not contract so much in cooling, and may be worked with greater facility; but the same will melt at a proportionably less temperature. When constructing vessels of larger capacity, the contraction of the thick body of zinc in cooling, would cause it to be drawn away from the inside of the case or shell; I therefore, when constructing such vessels, cast the zinc into the proper shape required, separate from the shell or outer case; and after preparing its outer surface by turning, I cover it with a coat of tin, and then place it into the shell also previously tinned on the inside, both the vessel and the shell being made hot enough to fuse the tin, which, on cooling, will cause them to adhere firmly together: or, instead of casting the vessels separate from the shell, I sometimes construct them out of rolled sheet zinc, and unite the parts by solder or otherwise, and then tin the outside, and place them within the case or shell as above described. My intention in thus strengthening or protecting vessels of capacity, when made of zinc is to prevent the melting or burning of the vessels at the parts where the handles or spouts are attached to them, which has hitherto been the case in vessels made of zinc, and has therefore prevented their use in common; I therefore sometimes make my improved vessels with only a broad hoop of thin sheet copper, or other metal casing, placed round the upper part of such vessel, and unite it to the zinc by tinning or soldering, or by rivets, as may be thought best, as shown by the figure drawn in the margin of these presents, which is a view of an ordinary shaped stewing pan, *a* being the zinc vessel, and *b* the rim of sheet copper or other metal, which hoop of copper or other thin sheet metal (which will not melt but at a considerably greater degree of heat than the zinc vessel,) will sufficiently protect the zinc vessel, and prevent it melting at the parts near the handle, unless submitted to a greater degree of heat than necessary; and after these hoops are connected to the vessels, I attach the handles, spouts, &c. to the vessel by rivets passed through both the zinc and the thin metal, in the ordinary manner.



Having now described the nature of my invention, and the manner in which it is to be performed, I wish it to be understood, that I do not mean or intend to claim as my invention, any of the parts which are old, or have been before used, or any of the parts separately; and I would observe, that I am aware that efforts have been made to use zinc in washing the inner surfaces of vessels, in like manner to tinning; I therefore lay no claim to such using of zinc, but I do claim as my invention, as an improvement in the manufacturing of culinary and chemical utensils and vessels, the strengthening and protecting the inner vessels by the outer casing, in the manner above described, when such vessels are formed of zinc, as above described. I verily

believe that this my specification does, in all and every respect, comply with the proviso contained in the above in part recited patent.

[*Rep. Pat. Inv.*

Specification of a patent granted to JOHN SYLVESTER, *Engineer, for certain improvements in apparatus for raising the temperature of air to warm and ventilate buildings. Dated June* 5, 1832.

To all to whom these presents shall come, &c. &c. Now know ye, that in compliance with the aforesaid proviso, I, the said John Sylvester, do hereby declare, that the nature of my said invention of certain improvements in apparatus for raising the temperature of air to warm and ventilate buildings, and the manner in which the same is to be carried into effect, are clearly set forth and explained in the following description, that is to say.

The first part of my said invention applies to a grate in which the fire is made nearly or quite on a level with the floor or hearth; under which grate I make an excavation for the twofold purpose of an ash-pit, and of supplying fresh air to the bottom of the fire; and I place the fire bars of this grate with their back ends resting upon the back brim of the ash pit. Each bar lies separate from the other, leaving the usual space for the ashes to fall through, and for the air to pass up into the fire; and from the front part of each fire bar, I make a prolongation of sufficient length to bear upon, and lie over some portion of the common hearth. Each prolongation is increased in width from the fireplace outwards, so much, that all the prolongations taken together, shall form one continuous plate or metal hearth in front of the fireplace, nearly or quite level with the floor, as may be convenient: and I make along the underside of each prolongation of the fire bars, a groove or furrow, which, by laying on its bearing, will form a tubular perforation for the admission of fresh air to the ash pit and thence to the fire; and for the emission of warm air into the room.

The outward or front line of the metal hearth, or the line which bounds the ends of all the prolongations, may be either straight or curved, and the fire bars, with their prolongations, may lodge in a curb of stone or metal, at direction. And in order the more readily to open the ash pit to remove the ashes, I leave four or more bars unfastened, except by their weight, and which may be taken out at pleasure.

And I do further declare that the second part of my said improvement consists in attaching to the sides or back, or to the sides and back of my fire grate, and extending as high as may be convenient, or the situation will permit, a vessel, or vessels, for holding water to be heated by the fire; and I apply near to the outsides of the said vessel, or vessels, the system of tubes used in the apparatus known by the name of the "Derby Hot Air Stove," and described in a work published in London in the year 1819, entitled, "The Philosophy of Domestic Economy, as exemplified in warming, ventilating, washing, drying and Cooking in the Derbyshire general infirmary; by Charles

Sylvester, Engineer:" pp. 11 and 18; the essential principles of which stove is, that currents of air are made to pass through a considerable number of tubes of about two or three inches diameter, and to impinge upon the outer surface of a heated cockle, the delivering orifices of the tubes being placed at about half an inch or three quarters of an inch from the heated surface of the cockle, in order to deliver the air with certainty and force against it, and carry off the heat. And in my improvement I cause currents of air to be directed through tubes similarly placed, but make the air impinge against the outside of my vessel, or vessels, of heated water, by which arrangement a more equable temperature may be kept up with much less care and labour in attending to the fire.

The proportionate quantity of area of all the tubes, to the cubic contents of the apartment, or apartments, to be warmed and ventilated, admits of considerable latitude, according to the aspect of the room, or the influence it is under from the heat or cold of contiguous apartments, or from the external air. The dimensions of the fire grate, as also of the vessels of water, must obviously depend upon the size of the apartment, or apartments to be warmed and ventilated, and upon the degree of heat to be raised.

And whenever it is desirable to keep up a large fire in the grate, for transmitting the heat copiously to distant apartments, without giving out too much heat to the room in which the grate is fixed, I form a cover to fit over and in front of the fire, having a doorway through which fuel may be supplied, and thus I constitute my fire grate into an air furnace, for the more ready heating of my water vessel or vessels.

And I do further declare that I lay no claim to the exclusive use of the tubes above mentioned, nor to any particular form of grate or of water vessel, but only to the invention of forming and placing of the fire bars with their furrowed prolongations, as before described, and to the bringing of currents of air through the tubes of the Derby hot air stove against the side of a vessel, or vessels, of heated water, instead of against the sides of a cockle heated immediately by the fire.

[*Ibid.*

Specification of a patent granted to WILLIAM RHODES, *Brickmaker, for an improved manufacture of Bricks for building purposes. Dated February* 14, 1833.

To all to whom these presents shall come, &c. &c.—Now know ye, that in compliance with the said proviso, I, the said William Rhodes do hereby declare the nature of my said invention to consist in manufacturing bricks, the earth of which has been soiled with pulverised coke. And in further compliance with the said proviso, I, the said William Rhodes, do hereby describe the manner in which my said invention is to be performed, by the following statement thereof, reference being had to the figures on the margin of these presents, that is to say:—

I proceed in the usual mode, to manufacture my bricks until I arrive at that process called in the trade, soiling the earth, and then, instead of soiling it with ashes, or what is called London soil, small coal, or a mixture of these substances, or, as has sometimes been done, with a mixture of coke ashes with London soil (the coke ashes not being pulverized, and bearing but a small proportion to the other ashes or other soil,) I soil my brick earth with finely pulverized coke, only in the proportion of one inch and three-quarters depth of pulverized coke over one foot depth of solid brick earth.

In order the better to explain the nature of my said improvement, it may be as well to state, that the finest sieves now in use for sifting the soil, are composed of wire meshes of the size shown at fig. 1, on the margin; whereas I use sieves composed of wire meshes of the size shown at fig. 2,* on the margin; the consequence of which, and the use of pulverized coke, is, that I avoid the internal honeycomb appearance of the ordinary brick when broken. I pulverize the coke which I use either by crushing the large pure coke between rollers and sifting it, or else by sifting coke breeze and using the fine particles that sift out of the breeze, or I bruise and break the coke, or breeze, by hand, and then sift it, and I prefer that none be used to soil the brick earth with but such as is fine enough to pass through a sieve of the fineness of that shown on the margin at fig. 2, though coarser will answer the purpose, but not so well; in fact, the finer it is the better, and it may be as well here to observe that in order to use the said sieve No. 2 to advantage, it and the coke should be kept as dry as possible, for which purpose I usually hang the sieves in damp weather before fires to heat and dry, and keep the coke under cover.

Now whereas, I claim as my invention, soiling the brick earth used in making bricks for building purposes either wholly with pulverized coke, obtained in manner aforesaid, or otherwise, or with pulverized coke mixed with other firing. And such my invention being, to the best of my knowledge and belief, entirely new, and never before used within that part of his said Majesty's United Kingdom of Great Britain and Ireland, called England, his said dominion of Wales, or Town of Berwick-upon-Tweed, I do hereby declare this to be my specification of the same, and that I do verily believe that this my said specification doth comply in all respects fully and without reserve or disguise, with the proviso in the said herein before in part recited letters patent contained, wherefore I do hereby claim to maintain exclusive right and privilege to my said invention.

[*Ibid.*

* The drawing in the margin of the specification shows the sieve fig. 1 to be composed of oblong meshes of about three-sixteenths of an inch by two inches long, and the sieve fig. 2 is composed of meshes about one-eighth of an inch square.

Specification of the patent granted to Moses Poole, *for improvements in apparatus used for certain processes of extracting molasses or sirop from sugar; in behalf of a foreigner resident abroad. Dated June* 29, 1830.

To all to whom these presents shall come, &c. &c.—Now know ye, that in compliance with the said proviso, I, the said Moses Poole, do hereby declare, that the nature of the said invention, and the manner in which the same is to be performed, are particularly described and ascertained by the following description thereof, that is to say—

The invention consists in the application of an exhaustion vessel, or exhaustion vessels, to be exhausted in the manner hereinafter described, to those processes of extracting molasses, or sirop, from sugar, whereby the air is made to press upon and rush through the sugar with great force and rapidity towards the vacuum, and thereby cause the molasses, or sirop, to be exhausted, or drawn, therefrom, the vacuum, or exhaustion in such vessels being produced by the condensation of steam, or by a Torricellian column. I would here observe, that the principle of applying a vacuum for the purpose of causing the liquid to be separated from the concrete matter, is well known, and consists of an open vessel with a partition near the bottom, and thus forming a compartment at the lower part of the vessel from which the air is exhausted by means of a pump, the partition being perforated with small holes, and covered with a cloth of silk or other material, upon which the matter to be operated upon is placed, and the atmosphere continuing its weight upon the surface of such matter, so long as the space below the partition is in an exhausted state, and by such pressure the liquid part is pressed through the perforated partition. But in order that the invention for which the patent has been obtained may be more clearly understood and carried into effect, I will proceed to describe the apparatus constructed according to the invention.

An open vessel, which may be called the separating vessel, is to be constructed, having a partition, or false bottom, within four inches of the bottom, which partition, or false bottom, is to be perforated with small holes throughout its surface; and on the top of such partition is to be spread a cloth of horse hair finely woven, brass wire, or other material. The sugar to be operated on is to be placed on the cloth which is to be spread over the perforated partition, or false bottom, to the depth of three or four inches; the bottom of this vessel is to be concave inwards, in order that the molasses, or sirop, may run towards a cock which is placed there for the purpose of drawing off the molasses. Should the sugar operated on not part freely with the molasses, it is to be damped with water or any other liquid, and by this means the sugar may be brought to any degree of clearness. If I wish to operate upon Muscovado sugar, as it now comes home cured in the usual way, that is, the molasses partly separated from it by allowing it to drain slowly away, as is at present the practice in the colonies, then I add water or sirop in sufficient quantity, and con-

tinue the operation until the required degree of fineness is obtained. Now, in place of using a pump, or pumps, for the purpose of exhausting the lower part of the separating vessel, the object of the present invention is to construct a spherical or other shaped vessel, of copper or iron, or other material; one of about six cubic feet capacity is a good size, but it may be increased or diminished *ad libitum*. This vessel I call the exhaustion vessel, which is to be connected to the lower compartment of the separating vessel already described, by a pipe, having a stop cock placed upon it; at the top part of the exhaustion vessel is placed a cock, opening outwards to permit of the air being driven out; and at the lower part of the exhaustion vessel there is placed a cock for drawing off the condensing water.

Now, in order to set the apparatus above described in operation, sugar is to be spread over the partition, or false bottom of the separating vessel, to the depth of three or four inches, and steam is to be permitted to flow from a boiler, by means of a connecting pipe having a stop cock upon it, into the exhaustion vessel, which will drive out the air; when this is effected, the air cock must be stopped; the exhaustion vessel having become full of steam, the cock on the steam pipe is to be closed, and the cock, placed on what may be called the condensing water pipe, is to be open: this condensing water pipe leads from a reservoir of water placed above the apparatus; the part of the pipe which is on the inside of the exhaustion vessel, has a rose head attached to it, for the purpose of distributing the water into minute jets, so as the more readily to condense the steam contained in the exhaustion vessel, and thus produce a vacuum therein.

The state or extent of the vacuum may be ascertained at all times by having a mercurial guage or barometer placed in any part of the exhaustion vessel; when the steam has been condensed, the cock on the condensing water pipe is to be closed, and the cock on the pipe which connects the exhaustion vessel with the separating vessel, is to be opened, and the result will be, that the air will press upon and rush through the sugar with great force and rapidity in the exhaustion vessel, and will thereby carry down the molasses, or sirop, into the lower part of the separating vessel.

Now it will be evident from the above description, that this apparatus may be made in any sizes, to suit the various places wherein it is to be put up. The manner in which I prefer to construct the apparatus, is, to have two or more exhaustion vessels, so that whilst one is acting on the separating vessel, a vacuum may be formed in the other, and thus a continued succession may be kept in action on the separating vessel. I will now proceed to describe the manner of constructing the apparatus when a Torricellian column is made use of for the purpose of obtaining a vacuum; in this case the exhaustion vessel, or vessels, are constructed similarly to those above described, but in place of a steam pipe, a water supply pipe, with a stop cock, or valve, upon it, must be used: the condensing water pipe in this case will not be necessary, neither will the cock, placed at the bottom of the exhaustion vessel for drawing off the condensing water, be required; but the air escape cock, or valve, and the connecting pipe

between the exhaustion vessel and the separating must be retained. To the bottom of the exhaustion vessel, a pipe, descending about thirty-three feet, and communicating with a reservoir, is fixed, having a stop cock, or valve, placed upon it. In order to set this apparatus to work, the cock on the pipe which connects the exhaustion vessel with the separating vessel, and the cock, or valve, which is on the descending pipe, must be kept closed; the exhaustion vessel is to be filled with water by the water supply pipe, and the air in the exhaustion vessel will then be driven out at the cock, or valve, placed at the top of such vessel for that purpose. The cock, or valve, on the water supply pump, and the air escape cock, or valve, are to be closed, and that on the descending pipe is to be opened, when the water contained in the exhaustion vessel will subside to the height at which the atmosphere will support a column of water in a vacuum, and the exhaustion vessel which is above that height, will be left in a state of vacuum or exhaustion; then the cock on the pipe which connects the exhaustion vessel with the separating vessel, is to be opened, by which the atmosphere will be brought to press on the surface of the sugar, and as before described. In this case, two or more exhaustion vessels may be made use of in succession; but it will not be necessary to have more than one descending pipe; but each of the vessels must have a stop cock, or valve, on the branch pipe which connects it to the descending pipe.

Now I would have it understood, that, although I have here described parts of apparatus which are well known and in use, I lay no claim to them separately; but what I claim as the invention is, the application of the exhaustion vessel, or vessels, the vacuum in which is obtained by the condensation of steam, or by a Torricellian column, when used for the purpose of extracting molasses, or sirop, from sugar as above described. [*Ibid.*

Notice of Ericsson's Caloric Engine.

The January number of the "Repertory of Patent Inventions," published in London, contains the following review of an unpublished pamphlet, written by Mr. Ericsson, and intended to explain the nature and operation of his newly patented engine, which is to be actuated by heated air. An application is now before Congress for a special act directing a patent to issue to Mr. Ericsson, and our Consul at Liverpool, Mr. Ogden, conjointly, it being stated that the machine, as specified, is their joint invention. The applicants are gentlemen who are both known to the scientific world, and under any circumstances an instrument which in their opinion is likely to supersede the steam engine, would be deserving of special attention; and, certainly, it is not the less so in the present instance because it is likely to be presented to the American public, and under the sanction of a patent from the United States.

We have seen the specification, which has been referred to a committee of Congress, but are not at liberty in the present stage of the business, to publish any remarks respecting it, with the exception of

those which have appeared in England, where Mr. Ericsson has obtained a patent. Should the patent be granted in this country, it will then come regularly under our examination.

EDITOR.

The Caloric Engine. By J. ERICSSON. An unpublished pamphlet.

It has become a common practice with individuals, when they have secured their inventions by patents, to publish a book, or a pamphlet setting forth the merits and principles of their inventions. The system may be said to be a good one—for too much publicity cannot be given to a valuable invention, nor too much reward be obtained by the inventor, so long as that reward is a part only of the savings which are produced to the country by the application of any new means of manufacture, or of any better means of actuating the machinery which produces manufactures; whilst, on the other hand, the extensive publication of a supposed valuable invention, will more quickly produce inquiry into its construction; its value will be tested, and its want of merit will bring it quickly into oblivion.

From the time that Watt succeeded in maturing the steam engine, one common desire appears to have been felt by a particular class of individuals, to strike into a new course of experiment; feeling, we suppose, that the steam engine no longer offered the possibility of obtaining so brilliant a reward as a *power* produced by different elements. Consequently, the propositions for producing *motive power* are more numerous than any other class of projects; and from this source many inventions of value may be expected, though probably very many more failures. The invention now before us, has for its object, the superseding the use of steam, by substituting expanding atmospheric air.

Since we have undertaken the editing of the Repertory, we have avoided making critical remarks on any of the numerous inventions which come before us; and it is only when called upon to step out of our usual course, by the receipt of a pamphlet, as in the present instance, or by some cause equally moving, that we are willing to place our opinion before the scientific world, in respect to any invention; and although we have been invited to this subject several times by our readers, owing to the Caloric Engine having made considerable noise in the world, we have withheld our opinion, being desirous to obtain the fullest information on the subject, and not to depend on the mere reading of the specification for forming our judgment. The application of expanded air for producing motive power is not in itself a new proposition, neither does Captain Ericsson put forward any such claim; on the contrary, many experimental engines of this description have before been made, and Capt. Ericsson was himself, some years ago, interested in one that was erected, we believe, near the docks,* which was, at the time, said to be likely to supersede all other means of producing power, and induced Dr. Arnott, when writing his second volume on Natural Philosophy, to express

* By Count De Rosen.

himself most strongly in favour of expanding air for producing power in place of employing steam. This had before been a favourite subject with the Doctor, he having obtained a patent for an air engine. In his work he devoted many pages to prove that any given quantity of fuel used to expand atmospheric air, would produce four times the quantity of power as if applied to convert water into steam; and yet these engines passed away, without bringing into being others of the same family.

The present engine may be readily described; it consists of two cylinders, one being termed the *hot air or working cylinder*, which is fourteen inches diameter'* the other being called the *cold air cylinder*, which is ten and a quarter inches diameter; each having a stroke of eighteen inches. These two cylinders are constructed similar to the cylinders of a steam engine, having induction and eduction ways, with ordinary slides for reversing the passage of the air to and from the two sides of the pistons. Each cylinder has an ordinary piston and a piston rod, which, by being affixed to either end of a beam, will be actuated simultaneously, the hot air cylinder by the expansion of the air, and the cold air cylinder by the action of the other end of the beam; the cold air cylinder performing the office of withdrawing the air from a vessel called the "regenerator," to make room for the hot air from one side of the piston of the hot air cylinder, when it has performed its office, and then forcing a quantity of air through the furnace to become heated to act on the other side of the piston in the hot air cylinder; the cylinders being double acting, the two operations are simultaneous. But thus far there is no claim of invention; the point of novelty is in placing a refrigerator between the hot air cylinder and the cold air cylinder, which the inventor has called the "regenerator;" it consists of an outer cylinder, or vessel, between seven and eight feet long, and eight inches in diameter. This vessel contains seven pipes, two inches in diameter. The long cylindrical vessel is divided into three parts, that is, the two ends are divided off by partitions through which the seven internal pipes pass, and thus open a way between the two ends of the regenerator; it will thus be evident that any air passing into one end of the regenerator will pass through into the other end of the regenerator by the internal pipes; but such air cannot get to the body or main part of the regenerator, till it has passed through the hot air cylinder. The cold air cylinder is connected, by means of a pipe, to one end of the regenerator, and another pipe from the other end of the regenerator, is connected with a series of small tubes, which pass over a furnace, and open into the induction pipe, of the hot air cylinder; the eduction pipe from this hot air cylinder opening into the body of the regenerator, in such manner that the hot air, after having performed its duty of actuating the piston, is intended to give off its heat to the air which is being driven through the internal pipes towards the fire. It should be stated that in order to prevent the hot

* We give the dimensions because the calculations hereafter given have reference to them.

air at once passing to the full extent of the regenerator, there are partial partitions which cause the air to take a circuitous, zig-zag course. From the other end of the regenerator, a pipe connects the outer vessel with the cold air cylinder; such pipe first passing through water to give off any heat which the air may contain when it arrives at this stage, so that it may pass into the cold air cylinder as cool as possible. The inventor also proposes that the seven pipes contained in the regenerator should also have partial division plates, alternately above and below, to cause the air continually to change its direction.

We believe the inventor will do us the credit to say that we have fairly described the nature of his combination. We will now permit him to speak for himself in describing the action of the machinery. He commences by stating that

"The leading feature of this engine, and which distinguishes the same from all other machines hitherto constructed for the purpose of obtaining mechanical power by the agency of heat, consists in this, that the heat which is required to give motion to the engine at the commencement, is returned by a peculiar process of transfer, and thereby made to act over and over again, instead of being, as in the steam engine, thrown into a condenser, or into the atmosphere as so much waste fuel.

"The well known phenómenon, that temperature, or quantity, of heat, is always equalized between substances, however unequal they may be in density, forms the basis of this new application of heat. But, previous to entering into the details of the caloric engine, it will be proper to give due consideration to its important aim, viz. that of producing a given quantity of mechanical force by a quantity of fuel so small, as to form only a fraction of that which has been stated by eminent experimentalists as the minimum.

"Several experiments which have been made tend to prove, and it is pretty generally acknowledged as a fact, that a given quantity of heat imparted to any gaseous body, will produce an equal quantity of mechanical force by the dilatation which it causes. And the most accurate experiments prove, that the combustion of one pound of the best coal is only capable of raising the temperature of 9000 lbs. of water one degree.

"On these grounds, the author of the best treatise on the steam engine has ventured to assert, that 'we have little to expect in the form of improvement;'* and he shows, by a set of tables, that an engine employed, for instance, in giving motion to the shaft of a mill, will consume from seven and a half to eight pounds of fuel in the hour for every horse's power constantly imparted to that shaft.

"In thus predicting limits to any further improvement, due consideration was, no doubt, given to the fact, that the heat which gives motion to a steam engine is still in active existence after having performed its duty in the cylinder; but the importance of that fact was probably passed over, because the heat imparted to the condensing

* See Tredgold's Treatise on the Steam Engine, p. 118.

water, although in *quantity* the same as previous to causing the motion of the piston, its *quality* is altered, viz. brought to a lower temperature, and thereby unfit for being carried back to the boiler to assist in raising a fresh supply of steam. But this circumstance of the heat being continually transmitted to the condensing water in the steam engine, proves its principle to be a direct misapplication of heat in producing mechanical force."

We would remind the author that many of the Cornwall steam engines are constantly raising from sixty to eighty millions of pounds one foot high by the consumption of every bushel of coals; if, therefore, he expects to supersede the steam engine, he must be able to show that his "caloric engine" is capable of performing more than the Cornwall steam engines with the same expenditure of fuel. We must confess that we do not understand what the writer means by the "*quality*" of the heat in steam being altered. If he means that some part of the heat has been taken up by the condensing water, we should understand him; but this cannot be fully expressive of his meaning, for he goes on to say, that the heat is "*unfit* for being carried back to the boiler to assist in raising a fresh supply of steam." Now we have always understood that the larger the quantity of heat which is contained in the water pumped back into the boiler, the less fuel is required to convert it again into steam; besides the condensed steam is pure water, containing no earthy matters, and is the most desirable to be used over again. However, it is not necessary that the inventor of an air engine should be thoroughly acquainted with applying heat to produce steam; but he ought to have it strongly impressed upon his mind that by withdrawing heat from steam in the condenser, a vacuum is produced behind the piston, and this advantageous effect cannot be produced when using air; neither can the volume of air be readily lessened when once expanded; it must, therefore, be an obstruction to the power on the other side of the piston—but more of this anon. To proceed with our extract—

"By reflecting on the nature of heat, it will become evident that there is nothing in its properties to prevent a given quantity once generated, or excited, from producing a continuous, and but slightly diminishing force by its dilating influence; for, if fluids contained in a vessel divided by a metallic partition, with a passage at each end, be heated towards one extremity, and then put into motion in contrary directions, their particles will, merely by the transfer of the same heat through that metallic position, successively repel each other with greater force as they appraoch the heated extremity, and with gradually less force as they approach the cold extremity of the vessel; or, in other words, the fluids made to circulate will continually dilate when at one end, and contract when at the other end of the vessel. By the caloric engine, consisting of a peculiar combination of pistons and valves, this constant dilation and contraction is employed for giving motion and power to machinery, without requiring any other additional supply of heat or fuel than what will make up for losses caused by radiation, and for the loss of heat which is occasioned by the circumstance that substances which are in a com-

pressed state have not so great a capacity for heat as when they are less dense."

The writer appears to have forgotten a very well understood property in pneumatics—that is, atmospheric air, when contained in a closed vessel, if pressed on at any one point, will instantly equalize that pressure in every direction, so that one part of the air will not remain more dense than another, and we suspect a very similar result will be found to take place in the "caloric engine."

[TO BE CONTINUED.]

¶ *On Machines for Parting Combs.* *By* W. ROGERS.

[From the Transactions of the Society for the Encouragement of Arts, Manufactures, and Commerce.]

Materials for combs are—1, boxwood,—2, ivory,—3, horn; and, 4, tortoiseshell.

These being cut into pieces of the proper size, and the general form of the comb having been given to them by common tools, such as rasps, scrapers, &c. the next, and most important part of the process, is cutting the teeth.

This was formerly done, in all cases, by means of a double saw, consisting of two parallel blades, one of them being deeper than the other, so that when the deepest blade has cut to the whole depth of a tooth, the other shall have cut only to the depth of half a tooth. In using it, the deep blade makes the first cut at a little distance from the outside of the material, so that by the first action of the saw the outer side of one tooth and half the inner side of the same tooth are cut. The saw is then advanced one tooth, so that the deep saw rests in the cut made by the shallow saw, while this latter is ready to form half the outside cut of the second tooth. Thus the saw is advanced a tooth at a time, the intervals between the teeth are rendered equal, and half the cut for the deep saw being already made, the tool is prevented from swerving, or cutting teeth of unequal thickness.

Soon after the invention of the circular saw it was applied to comb cutting, by fixing on one axis two circular saws, one of greater diameter than the other, and regulating the distance between them according to the fineness of the teeth to be cut. Both the straight and circular double saws are now in use, the former being still applied to cutting combs out of all the four above mentioned materials, the latter being used chiefly for combs of box and of ivory.

Box wood and ivory, if subjected to the perpendicular action of a cutter would break and splinter; but horn and tortoise shell, being of a laminated texture, and capable of being rendered soft and flexible by heat, will yield in this state to the action of a sharp vertical cutter without splintering.

About twenty years ago, the principal house in London at that time for the sale of combs, had received from abroad some patterns of ornaments like the spikes and balls of coronets, to be attached to the tortoise shell combs.

They gave the order to execute these to an ingenious artist of the name of Ricketts, who contrived a punch, by the successive pressure of which on a thin piece of warm tortoise shell, he cut out the pattern, piece by piece. On disengaging the pattern from the other part, he observed to himself, "here are two combs cut out of the material for only one."

Improving on this hint, he soon contrived a machine in which a single cutter descended vertically, being put in motion by a treadle and wheel: the bed on which the tortoise shell was fastened was notched at the side, and these notches fitted into, and corresponded with, those of a rack placed parallel with it. After every cut the bed was moved forward by hand the distance of a single notch, and thus an equal interval between all the cuts was secured. But the form of the tooth of a comb being that of a very long triangle, it was necessary that, as the bed was shifted forward notch by notch, there should also be an alternate motion given to the bed: this likewise was given by hand; and thus the first rude machine for parting combs, that is, for cutting one set of teeth out of the intervals of another set, was completed.

When the knowledge of this machine began to spread abroad, various contrivances were invented to advance the bed, and give the necessary alternate change in direction, by machinery. In some cases, this alternation was given to the bed, in some to the cutter itself.

Previous to this time, however, it had occurred to the original inventor, Mr. Ricketts, that the machinery necessary to produce this alternation of direction might be dispensed with by making the cutter double, that is, composed of two blades set obliquely, so as nearly to touch at one end, and at the other to be as far apart as the width of a tooth, at the same time the blades made a return at their ends to liberate the extremities of the teeth.

It is evident that, while the cut is making, the material must be stationary, and that in the interval between the rise and descent of the cutter the bed must have advanced the breadth of a tooth. This was effected in Mr. Ricketts' double cutter machines by working the cutter alone by a treadle, and advancing the bed by a screw, to the end of which a winch was fastened, so that one complete, or one half turn, gave the necessary advance, a pause being made after each turn or half turn, to bring the bed to a stop while the cutter was in action.

Mr. Roger's machine obtains this end without the use of a treadle, by means of a single winch. The axis to which the winch is fixed gives motion to the cutter by means of a crank, and on the axis is a wheel having part of the cogs removed; this wheel takes into a common cog wheel on the axis of a screw, by the turning of which the bed with the work on it is moved forwards. Hence it is evident, that while the machinery for raising and lowering the cutter is in constant action as long as the winch is turned, the screw, which gives motion to the bed, is still, and out of action, during that part of the revolution of the winch in which the cogs of the two wheels are not bearing on each other. By enlarging the space from which the cogs of

the second wheel are cut away, the interval between one tooth and another is diminished; so that any given distance of teeth may be obtained by putting on to the axis of the screw, a wheel with the proper number of cogs.

The machines for parting combs, in all their modifications, have this advantage, of cutting two set of teeth out of the same quantity of material as with the common saw, is sufficient only for one set.

But every scale of tortoise shell is wedge-shaped at the margin, and therefore it is only to the thick pieces cut out of the middle part of the scale that this new invention can readily apply, for the wedge-shaped margin is not thick enough for the back of a comb. But, on the whole, the advantage as regards tortoise shell is very great, for the prime cost of rough shell of fine quality is four guineas per pound—a price greater than that of silver.

In many cases, however, the thin edges of a piece of tortoise shell may be strengthened by soldering it to a thicker or larger piece for a back. This is done by heating the shell and pressing it at the same time; but much care is required lest the shell be overheated, in which case the lamellar texture is destroyed, and the substance becomes as brittle as glass. In Germany and in France many combs are made, the ornamental part of which is stamped by strong pressure in hot steel dies, and two or more pieces of tortoise shell are united in the same manner; but the colour of shell so treated is injured, besides being rendered very brittle.

The best English makers, after smoothing and rasping the two surfaces that are intended to be united, place them between two thin boards, and insert the whole in the chops of a screw press. The press is put for some hours into boiling water, and is tightened from time to time; and thus, by allowing a sufficient time, a perfect junction is obtained at a heat so low as not to injure either the colour or texture.

¶ *On the Prevention of Dry Rot. By* James Smith, *Esq.*

[From the same.]

The following experiments, showing the effect of lime in preventing dry rot in wood, are extracted from an Essay on the Dry Rot in Timber, by James Smith, Esq. of Leith, and presented by that gentleman to the Society.

I took six kinds of wood as noted below, having two of each piece, or twelve in the whole. These, on the 29th of May, 1822, I buried in a damp confined situation at my lead works, near Edinburgh.

Into one pit I put six of these thin pieces, viz.

1. Scotch larch, fresh and green.
2. Elm, dry.
3. Oak, from a small branch one year cut, good and sound.
4. Ash, green.
5. Scotch fir, green.
6. Scotch fir, dry and half decayed with the dry rot.
7. A piece of wood charcoal.

These I placed on edge and covered them over with the damp soil, that contained a good deal of the decayed leaves, and such other matter as would assist materially to bring on the dry rot. In a second pit, three or four yards from the former, and in exactly the same ground, I sprinkled a quantity of quick lime, sufficient to make the bottom white. I then packed six pieces of wood similar to the above, being a part of the very same wood. These were also put on edge in the same manner. A little quick lime was put on, so as to allow a part to go betwixt each piece, and also to be covered at top, the same as below; then this, also, was covered up with earth, the same as the former, to the depth of twelve inches.

In September, 1823, I examined these two pits, by digging up the specimens of each, which were damp and heavy. The whole of the pieces of wood where lime had not been used were evidently affected with dry rot. I put them into a closet, that they might dry gradually, and I occasionally put them near the air of a fire to assist to dry them, and then again put them by: they had been buried about sixteen months.

In June, 1824, I again more particularly examined each piece of wood, and I found that the six pieces of the first pit were completely affected with the dry rot, apparently more so than when they were taken up in October, 1823, being eight months before. Nos. 3 and 4 are, however, less so than the rest. On No. 4, two vegetable fibres have grown from the wood, four inches long, like gray thread.

The specimens in the second pit, into which lime had been put, were as fresh as when they were first put in. The pieces are harder, and No. 6 appears much sounder than when it was first buried; but No. 6, of the other pit, is quite rotten. The charcoal in both pits has undergone no change.

At the suggestion of Dr. Turner, of Edinburgh, (now Professor of Chemistry in the London University,) I cut off a part of No. 1, which had previously been buried in May, 1822, with lime, also larch, and a piece of Scotch fir No. 4. I also took of fresh wood that had not been so treated,

1. A piece of good dry larch wood.
2. Ditto, rather wet.
3. A piece of Scotch fir, very sound.
4. Ditto, young wood.

These were all buried, in June, 1828, in wet, damp ground, around old leaves and decaying wood.

June 5, 1829, they were all removed and examined; they were all of them wet, and therefore were put into a shed to dry.

July 5, they were all dry; and Nos. 1 and 4, which had been previously buried with lime, were both sound, especially the larch. Of the four unprepared pieces, 1, 2, and 3, were a little affected with dry rot; No. 4 was still more so, and was fast going to decay.

The following extract of a letter from Mr. T. Kirkby, of York, dated November, 1822, bears on the same subject.

"Some twenty-five or thirty years ago, when foreign timber was

very scarce, and consequently very dear, I was engaged in building, and, to save expense, I used English fir for spars and joists; but knowing that the English fir was liable to the dry rot, the idea struck me that the steeping of it in lime and water might preserve it from early decay. I therefore had a trench dug, sufficiently long to admit the pieces of timber to lie in it, and filled it with lime and water of the thickness of a puddle, in which I laid the timber cut up for use, and let it soak for the space of a week; had the timber been larger, I should have allowed it to steep some time longer. It is now twenty-five or thirty years since I used this timber, and it is now as perfectly free from the dry rot as it was at that period."

¶ *On Preventing the Adhesion of an Earthy Crust to the inner Surface of Steam Boilers. By* James Bedford.

[From the same.]

Almost all natural waters hold in solution both carbonate and sulphate of lime, two earthy salts, of which the former is thrown down by bringing the water to a boiling heat, and the latter by evaporation. On this account it is, that if the inside of a steam engine boiler be examined after having been in use for a few days, it will be found to contain muddy water, and an earthy crust will be seen adhering to the iron plates of which the vessel is formed. The rate at which this crust is deposited depends upon the hardness of the water employed, that is, on the proportion of the above mentioned earthy salts which it contains. This crust is a much worse conductor of heat than iron is, and therefore, a boiler lined with it, even to the thickness of a tenth of an inch, possesses the following defects. The water which it contains is not so soon brought up to the boiling point, and a greater quantity of fuel is required to produce a given quantity of steam, because a larger proportion of the heat given out during its burning is carried up the chimney and lost. It becomes, therefore, necessary, from time to time, to remove this crust, which is usually done by a hammer and chisel; but this operation not only incurs a waste of time, but the boiler is often seriously injured, and rendered leaky by means of it.

It has been found that if a few potatoes are thrown into the boiler when it is again filled, after having been cleaned out, the formation of crust is sensibly retarded, and that the adhesion of it to the sides of the boiler is greatly weakened, so as to allow of its being detached more speedily, and with much less hazard.

Another method of producing the same effect has been pointed out to the Society, by Mr. James Bedford, of Leeds, druggist. He put into a large steam boiler between two and three gallons of sperm oil *foots*, and found that after eight weeks' constant use, the deposit of crust was very small compared to what it used to be from the same water alone, and also that the crust could be cleared off by means of a common stiff broom. The application of oily matters for this pur-

pose, though original on the part of Mr. Bedford, is not absolutely new; for the Society have been informed by one of their members, that he has known an iron boiler using Thames water preserved in constant use for seventeen years by cleaning it often, and smearing the inside with oil or tallow after each cleaning.

The Society, however, have reason to believe that neither of the above methods are in common use, and have, therefore, directed this short statement to be published for the benefit of those whom it may concern.

¶ *Description of a Wooden Road.*

[From the same.]

Blackheath Hill, *October* 6, 1832.

Sir,—It is, doubtless, the duty of every traveller in foreign lands to observe attentively the improvements that have been made in useful arts in the various places through which he may pass; and when he perceives any thing conducive to the happiness, comfort, or prosperity of a people, unknown at home, to communicate the same, for the general benefit of his fellow countrymen.

Under this impression, I take the liberty of soliciting that you will lay before the Society of Arts, &c. the following account of a mode of constructing roads in cities, hitherto totally unknown in England, and by far the most perfect that has ever come under my notice. I think no person will deny that it is desirable to have the streets of towns so paved, that in dry weather there should be no dust, and in wet weather no mud, and as little noise as possible from the passing of carriages. All these advantages are combined in the kind of road I allude to, besides being smoother than a macadamized road, even when the latter is in its most perfect state.

In countries abounding in wood, various schemes have been adopted for the formation of roads of that material; but hitherto they have always been made by laying logs, or planks, parallel to, or at right angles with, the sides of the way; these logs were easily displaced, and soon cut up by the horses' hoofs, and when once out of order, no road can possibly be worse. The improved road, on the contrary, will last five or six years without repair, and, were it not for the high price of timber in this country, might be adopted with the greatest advantage; and being a plan of considerable national utility, possibly the government might be induced to allow the importation of timber for this purpose, duty free.

The following instructions will be found sufficiently practical and explicit as a guide to the construction of roads on this principle.—

1. Prepare a hard and level bed of gravel, or broken stone, covered with sand, and well rolled, about nine inches lower than the intended surface of the road.

2. Take logs of timber of sufficient diameter, and, by means of

equidistant circular saws, cut them into equal lengths of one foot each.

3. These round logs must now be passed under a sexangular steel stamp, which cuts off the outside of the log, and leaves little more than the heart of the tree, in the form of a sexangular block.

4. Two sides of this block must now be bored three inches deep with an inch borer, for the reception of a wooden pin six inches long, which is to be driven into the hole already prepared in the log; the three inches of the pin which project being inserted in the next log. The operation of laying the blocks of wood, and driving the pins, proceeds rapidly, and the surface of the road soon assumes a beautiful chequered appearance, somewhat resembling an inlaid floor; and the fibres of the wood standing vertically, and not horizontally, there is not a possibility of splintering. The whole is held compactly together by a narrow strip of stone pavement, and nothing now remains to be done but to cover it with a thin coat of boiling tar, and on the tar a fine layer of sand, by which means every interstice is completely filled up, and moisture excluded.

In addition to the advantages already mentioned of never being either dusty or muddy, this road is little inferior to a rail-road in point of smoothness; so that it may be safely asserted that one horse will easily draw on it the burden of two.

If at the end of five or six years (where the traffic is great) the road should be so injured as to require repairing, it may be done by taking up the logs, sawing a new face, and replacing them, when the road will be again equal to new.

The one which I saw constructed in the above mentioned manner was in one of the most frequented streets of a populous city, and, when I left that country, had stood between three and four years unimpaired.

Should any further explanation or instruction be required, it will be most readily furnished by,

Sir, yours, &c. &c.

A. Aikin, *Esq.*, *Secretary &c. &c.* James Heard.

Blackheath Hill, *October* 13, 1832.

Sir,—I hasten to supply the omissions in my communication on the construction of a wooden road upon new principles, by informing you that the first experiment was made in St. Petersburgh, before the house of the governor-general, in the street called the Great Morskoi. After this piece of road had stood several years unimpaired, the plan was tried on a larger scale in the street called the Maloi Millionne; and this trial only served to confirm the good opinion the public had already conceived of this mode of pavement; and, consequently, in the course of last summer (1832,) the Nevsky Perspective, from the Admiralty to the Anitchkin Palace, was paved in a similar way—not, however, from one side to the other (this street being of an ex-

traordinary width,) but two strips, each sufficiently wide for two carriages to drive abreast, the original stone pavement being left in the intermediate spaces.

I neglected also to state, in my communication, that a road constructed in this manner should not be bound together so tight by the side pavement as to prevent the possibility of a slight expansion of the wood from the absorption of moisture. I was led to make this remark by the swelling up of a small piece of foot pavement on a cast iron bridge, where the iron sides preventing the least expansion, the natural consequence of the absorption of moisture was the swelling up of the pavement; but this never occurred where the log pavement was held together by a strip of common stone pavement.

I think it also necessary to observe, that although the above mentioned streets, in which the experiments have been made, are places of so great traffic that roads constructed upon the macadam principle were found of insufficient durability, yet no excessively heavy loads, comparable to the wagons and heavy carts used in England, ever passed over them; I therefore would not pledge myself that such a road (however desirable for the west end of London,) would bear uninjured the enormous burdens continually passing through the streets of the city

I am, Sir, &c. &c.

A. Aikin *Esq. Secretary &c. &c.* James Heard.

CELESTIAL PHENOMENA, FOR JULY, 1834.

Calculated by S. C. Walker.

D.	H	M.	S.					
7	12	21		☿ g. elongation		East	26°.3′	
8	3	6		☿ ☌ ☾	☿	South	4°.3′	
8	13	22		♀ ☌ ☾	♀	South	2°.5′	
29	0			♀ ☌ χ Leonis	✱	North	9′	
30	2	22		♂ ☌ ☾	♂	North	1°.5′	
30	14	52		♃ ☌ ☾	♃	North	58′	
3	13	35	43.3	Im. ♃'s 2 Sat.				
5	14	32	47.4	Im. " 1 "				
10	16	12	34.8	Im. " 2 "				
12	16	26	41.0	Im. " 1 "				
21	12	48	54.3	Im. " 1 "				
28	14	42	35.9	Im. " 1 "				
13	8	2		Im. 88 Virginis		,7,	N175°	V201°
13	8	47		Em.			53°	290°
18	15	35		Im. 155 s Sagittarii		,6,	27°	73°
18	16	52		Em.			347°	397°
30	13	49		Im. ε Tauri		,4,	79°	43°
30	14	39		Em.			324°	283°

Notice of the Meeting of the Association for the Advancement of Science at Edinburgh.

FOR THE JOURNAL OF THE FRANKLIN INSTITUTE.

I have been requested by the Secretary of the Council of the British Association for the Advancement of Science, to insert in your Journal a notice, that the next meeting of that body will be held at Edinburgh in the week commencing Monday, September 8th, 1834. It is understood that this is an invitation to the scientific men of the United States, and such as may find it in their power to attend, may assure themselves of a most cordial welcome, and a rich repast of science to repay them for their journey.

HENRY D. ROGERS.

Meteorological Observations for April, 1834.

Moon.	Days.	Therm. Sun rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches	Inches			Inches.	
	1	40°	49°	30.00	29.90	SE. S.	Moderate.		Rain.
	2	46	47	29.75	.84	S. SW.	do.	0.70	Cloudy—rain.
	3	38	52	30.20	30.20	NW.	do.	0.09	Cloudy—shower.
	4	36	48	.20	.35	NE.	do.		Clear—cloudy.
	5	32	47	.40	.40	NE.	Brisk.		Lightly cloudy—cloudy.
	6	36	46	.25	.25	NE.	do.		Clear day.
	7	42	48	.10	.10	NE. SE.	Moderate.		Cloudy day.
⊗	8	51	55	29.90	29.90	SE.	do.	0.95	Rain.
	9	51	62	.90	.85	SE.	do.		Rain—cloudy.
	10	42	42	.95	30.05	SE. E.	do.		Cloudy—light clouds.
	11	36	59	30.10	.15	NE. SE.	do.		Cloudy day.
	12	41	70	.16	.16	W. SE.	do		Clear day.
	13	45	74	.05	.00	SW.	do.		Clear day.
	14	54	74	29.90	29.90	SE. SSE.	do.		Clear day.
	15	49	78	.80	.75	SW.	do.		Clear day.
☾	16	50	80	.60	.60	W.	do.		Clear day.
	17	52	84	.60	.60	W.	do.		Clear—hazy.
	18	43	62	30.00	30.00	W.	do.		Clear day.
	19	44	54	29.94	.00	SE.	do.	0.22	Cloudy—rain.
	20	49	69	.73	29.75	NW.	do.		Clear day.
	21	52	70	.77	.80	SE. S.	do.		Cloudy—lightly cloudy.
	22	48	58	.80	.75	S. E.	do.		Cloudy day.
	23	44	52	.74	.60	E.	do.		Cloudy—mist.
	24	46	60	.64	.70	W.	Blustering		Clear day.
	25	36	38	.75	.70	NE.	do.	0.10	Drizzle—snow—drizzle. [night.
	26	33	52	.64	.56	SW.	do.		White frost: cl'dy: rain & snow in
	27	29	44	.50	.50	W.	do.	0.23	Clear: ground covered with snow:
	28	34	61	.50	.50	W.	Moderate.		Clear day. [cloudy.
	29	44	54	.45	.45	E. W.	do.	0.20	Rain—showry.
	30	39	58	.40	.40	W.	do.		Clear day.
	Mean	42.73	58.23	29.86	29.86			2.49	

	Thermometer.	Barometer.
Maximum height during the month,	84. on 17th.	30.40 on 5th.
Minimum do.	29. on 27th.	29.40 on 30th.
Mean do.	50 48	29.86

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AMERICAN PATENTS, LIST OF, WITH EDITOR'S REMARKS, &C.

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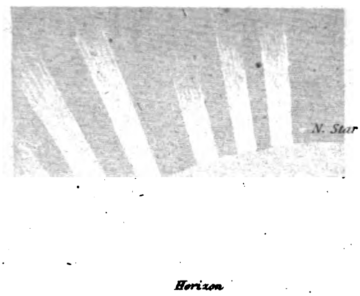
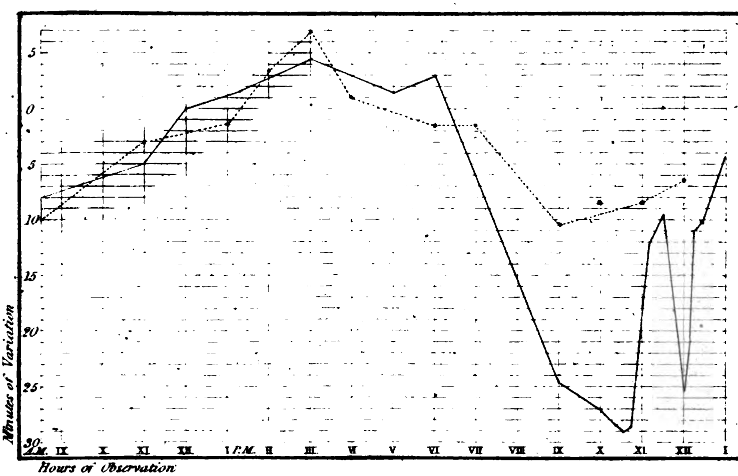
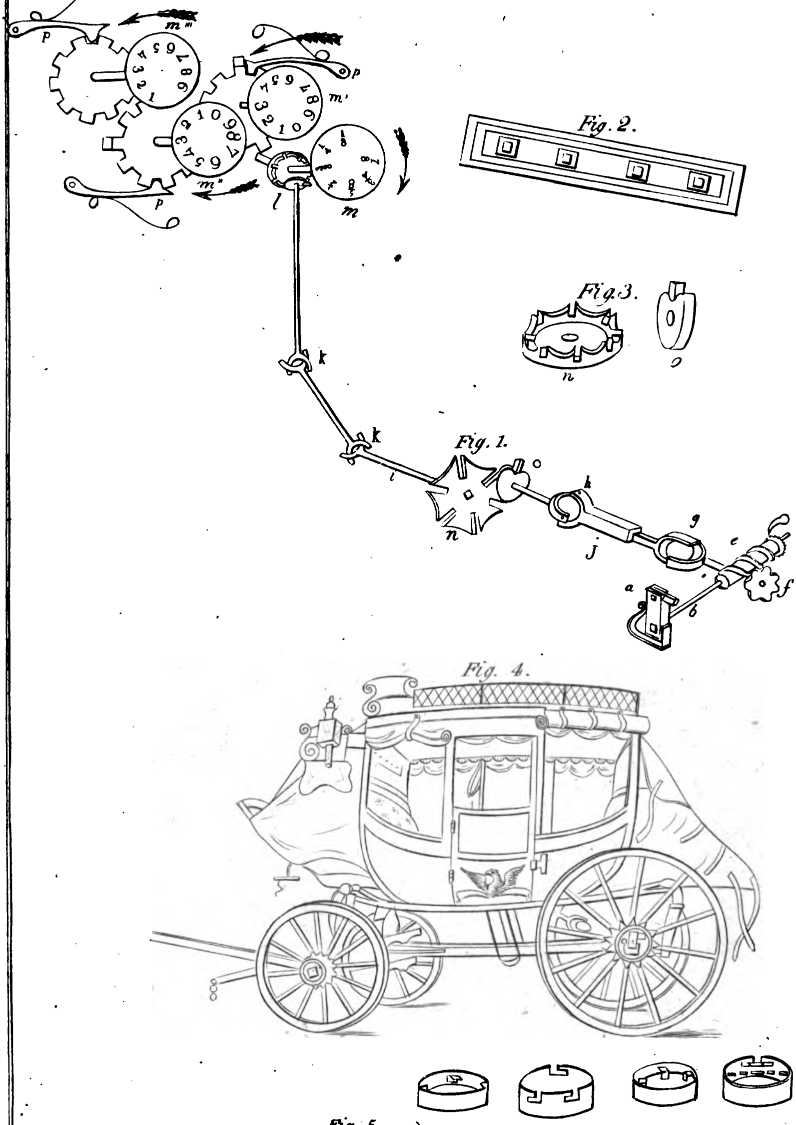

N. Star
Horizon


Minutes of Variation
5
0
5
10
15
20
25
30
A.M. IX X XI XII I P.M. II III IV V VI VII VIII IX X XI XII I
Hours of Observation

W. A. TURNER'S ODOMETER.



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